

ROBOTICS STARTER

Build Robots. Learn Logic.



Sneak Peek

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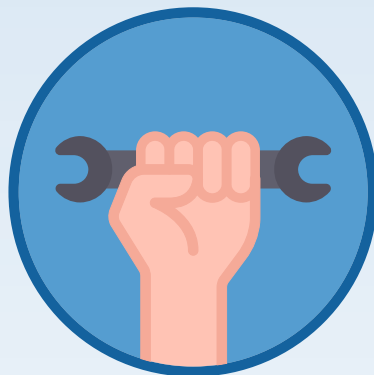


**“ I never dream
about success.
I work for it.”**

Make the Most of Your Kit

Innovate

Share



1 Learn

Printed Instructional Manual

Follow detailed instructions in this manual and learn how to build exciting Robots with your Kit.



Self Paced Online Course

Log-In, Register and get access to the Kit Specific courses on Let's Avishkaar Platform.



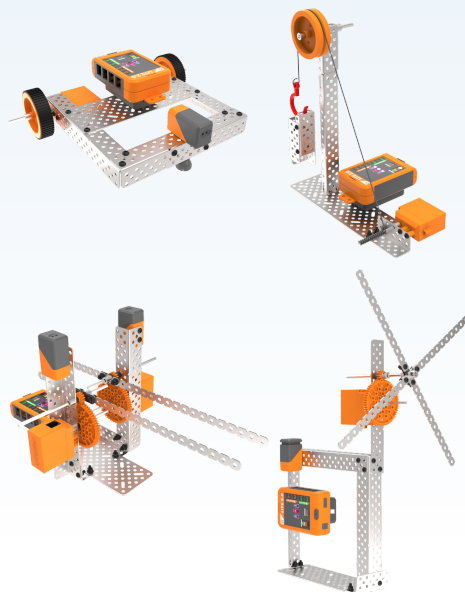
Video Series

Skip the manual and master your kit through an Expert online video series



2 Build, Code & Control

- Build innovative projects using your kit, and control the Robots using Avishkaar Remote and Code using Avishkaar Maker Studio.



3 Join Let's Avishkaar

- Join Let's Avishkaar to share your innovative projects, attend free webinars and know about latest updates in the tech world.



- Scan the QR Code to visit the Let's Avishkaar page on Facebook



Scan the QR Code or visit the link : <https://bit.ly/3uLiLeW> - and begin learning.



Win



4 Upload Projects

- Upload your projects and share them with other innovators around the globe. Receive praise and feedback alike.



- Scan the QR Code to begin uploading projects.



5 Enroll

- Participate in competitions like Innovator of the Month challenge, IRC, Hackathon and Makeathon.



- Scan the QR Code to visit the competitions page and enroll in ongoing competitions.



6 Compete

- Compete with other Innovators across the globe in Asia's largest Robotics and Innovation Challenge - Avishkaar league, and win grand prizes worth Rs. 5 lacs. and sponsored international trips.



Achievement Sheet

Use the Achievement sheet and the stickers provided, to track your innovator journey. Paste the Achievement Stickers from the sheet provided on to the specified location here.

1 Congratulations !



You have achieved the 'Innovator's Oath Badge' from the sticker sheet.

2 Congratulations !



You have achieved the 'Register Your Kit' from the sticker sheet.

3 Congratulations !



You have achieved the 'Familiarize Yourself Badge' from the sticker sheet.

4 Congratulations !



You have achieved the 'First Project Badge' from the sticker sheet.

5 Congratulations !



You have achieved the 'Third Project Badge' from the sticker sheet.

6 Congratulations !



You have achieved the 'Fifth Project Badge' from the sticker sheet.

We are Proud of your Innovations !!



Celebrate Your Achievements

Stick your Achievement Stickers above



Innovator's Oath

Take the Innovator's Oath below, to pledge yourself to lifelong commitment towards Innovation and Problem Solving. Share a photo on the Let's Avishkaar Community - **fb@LetsAvishkaar**

I (write your name) _____

*solemnly swear that, since I am
now on the path of innovation,
I will not give up until my
innovation, my project is ready.
I will hone my skills and tools
and use them well. Innovation
and I will be inseparable.
I will always share my
innovations with other
innovators and learn with them.*

Your Signature

**Innovate.
Share. Win.**

f @LetsAvishkaar



Congratulations !

Give yourself the 'Innovator's Oath Badge' sticker on your Achievement Sheet, on Pg. no. 6

Welcome to Let's Avishkaar

Register Your Kit

Register your kit to get access to a Learning Content for your kit.

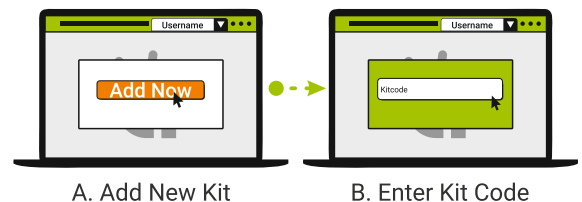
1 Visit and Sign In

- Open your Web Browser
- Visit and Sign In at link - <https://www.avishkaar.cc>
- Go to the drop-down menu, located around the Username, and select **My Profile** from the options



2 Add your new Kit to your list

- On the **My Profile** page, **scroll down** to Kits Owned section, click on **Add New**, to register your Kit
- Enter your Kit code, from the **Support and Manufacturer's Details** section of the packaging.
- Click on **Add** to complete the process.

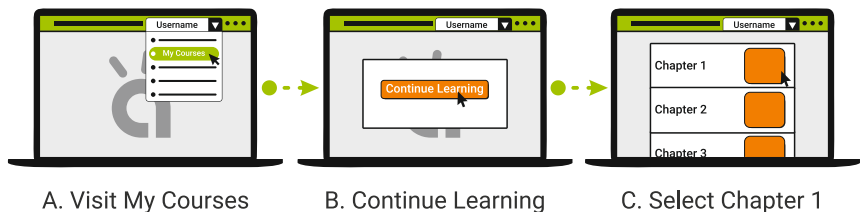


Start your Online Course

Access courses with content that are created for Innovators.

Begin your Learning on the Let's Avishkaar platform

- From the User Drop-Down menu, select and Click on **My Courses** to view your active courses.
- On the currently ongoing course Click on Continue Learning to go to access the course's chapters and contents.
- Click on Chapter 1 to start.



Congratulations !

Give yourself the 'Register Your Kit' sticker on your Achievement Sheet, on Pg. no. 6

Armour Check: Explore Your Kit

All (s)heroes need their super-weapons. Let's familiarize you with yours.

Electronics

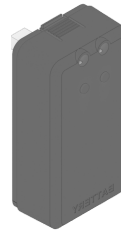
The Avishkaar Design System includes Programmable Electronics such as the Robotics LITE 2.0 Brain which allows you to control Motors and Sensors.



Lite 2.0 Brain x 1



High Speed Motor x 2



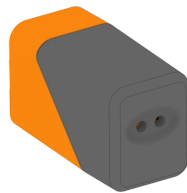
Battery x 1



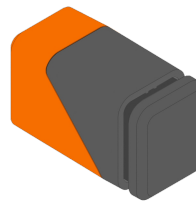
Cables x 4

Sensors

The Robotics Starter Kit includes sensors that can be used to make autonomous robots.



IR Sensor x 2

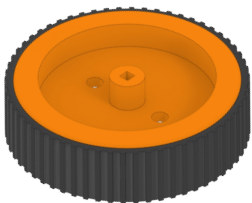


Touch Sensor x 1

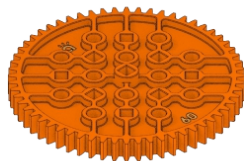
Construction Parts

Easy-to-use metal and plastic parts that can be easily put together to make exciting robots.

Plastic Parts



Wheels x 2



Big Spur Gear x 2

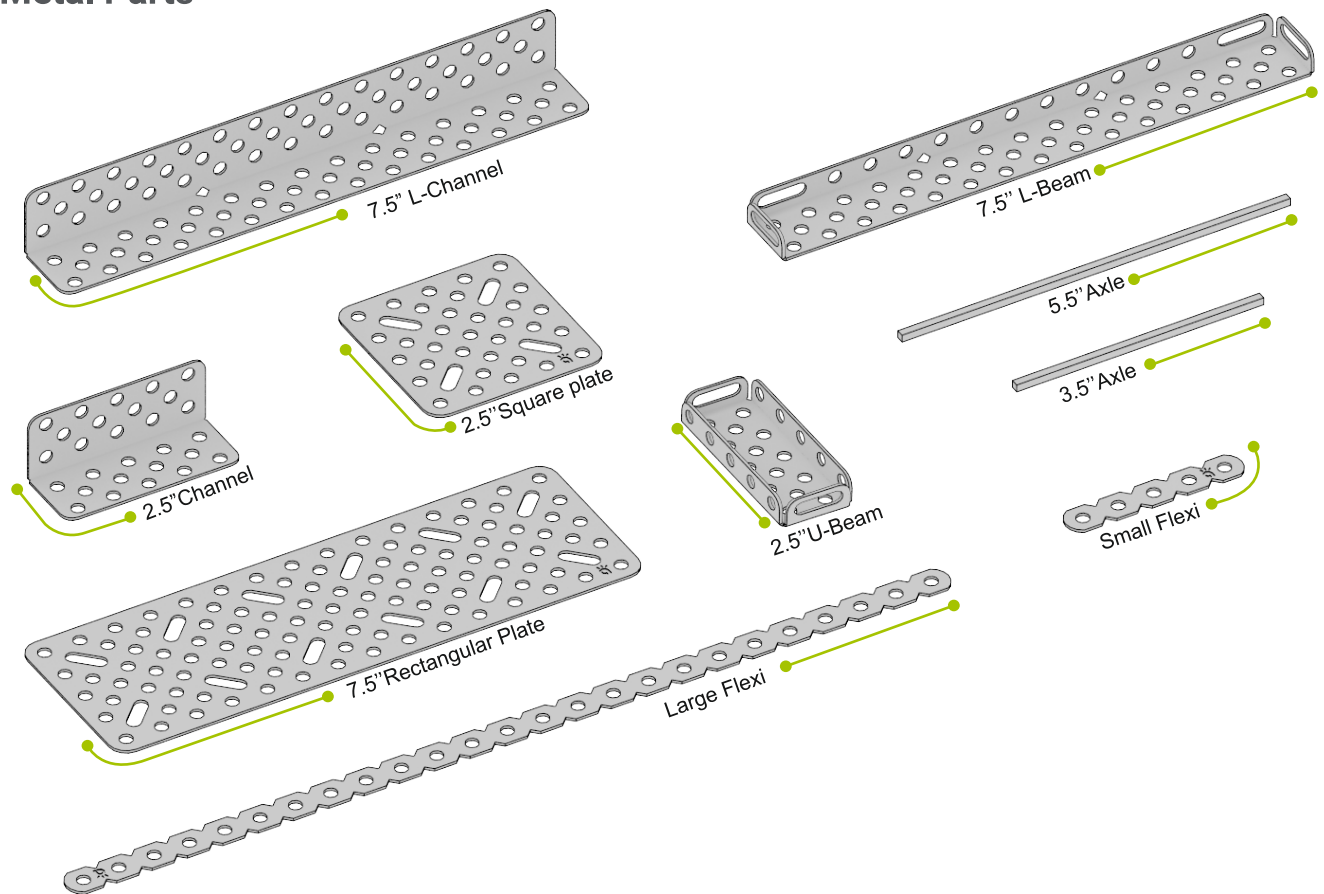


Medium Spur Gear x 2



Small Spur Gear x 2

Metal Parts



Tools

Robotics Series Bolts and K-Nuts with a strong metal and easy-to-use design for strong joints of your grand robots.



Caster Wheel x 1



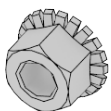
Allen Key x 1



Plastic Hook x 1



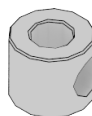
Spanner x 1



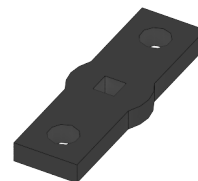
K-Nuts



8mm & 6mm Bolts



Axle Lock



3-Hole Connector



Filler

Note: 6 mm Bolts are pre-fitted to Motors, Sensors and Avishkaar Battery.

Robotics LITE 2.0 Brain



Programmable Buzzer

The programming of tones and time gives you many different sounds to play with.



Sensor Ports

These ports help you connect sensors to the Brain.



Two Programmable RGB LED

The intensity of red, blue and green colours produce many unique colours. You can program that.



Battery Level Indicator

An indicator will guide you the energy level of your robot. Whether is feeling low or full of energy.



DC Jack

Connect the 9V Battery to this port.



Power Button

This button helps you to turn the brain ON or OFF.



Programming Port

Connect your Programming wire to this port.



Motor Ports

These ports help you connect motors to the Brain.



Other Features



Programmable Brain



Compact Size



In Built WiFi

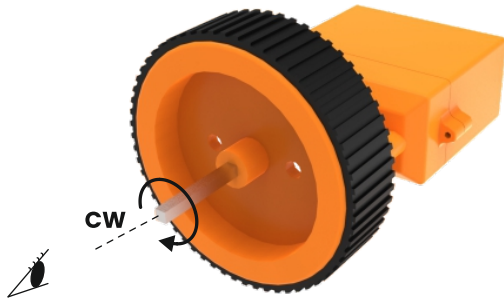


External Battery

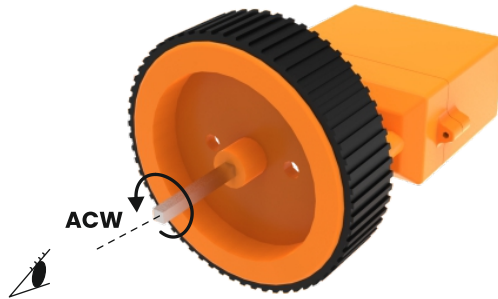
Interfacing with Motors

Identify the rotation direction of the motor by looking at it with Axle facing you.

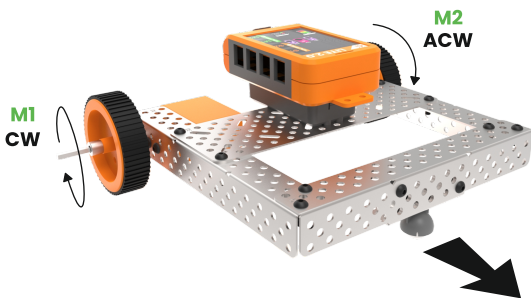
Clockwise Rotation



Anticlockwise Rotation



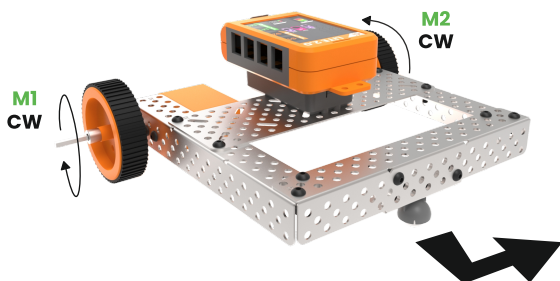
Robots move in different directions by the combination of the rotation from each wheel. For example -



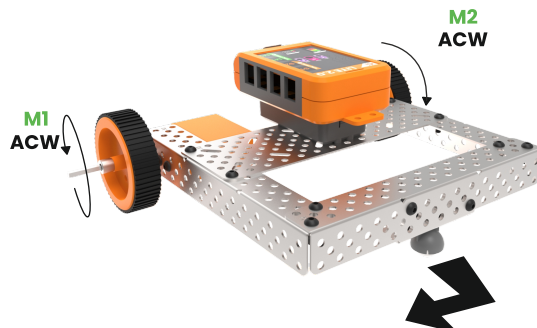
Forward Direction



Backward Direction



Left Direction

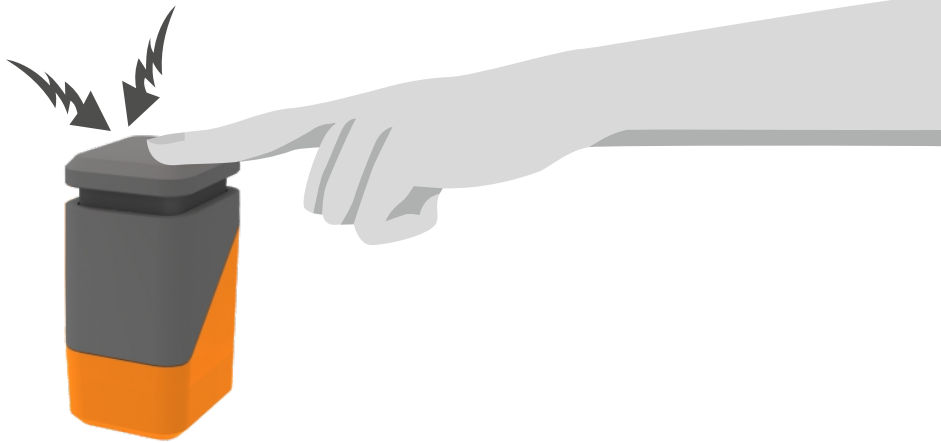


Right Direction

Interfacing with Sensors

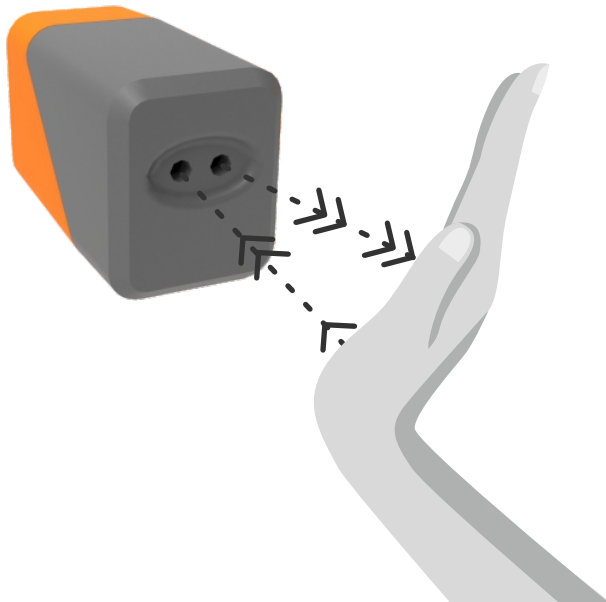
Touch Sensor

- Touch Sensor works like a push button or a limit switch. It simply gets triggered when it is touched or pressed.
- In a Touch Sensor, the Sensor state is HIGH when the sensor is pushed with any object.



IR Sensor

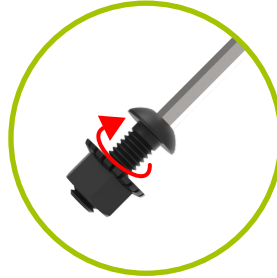
- All but the very closest object emit radiation in the form of the heat that can be detected by infrared sensors. As infrared (IR) sensor is an electronic device that measures and detects infrared radiation in its surrounding environment.
- In an IR Sensor, the Sensor state is HIGH when a reflective object is in front of it. Black or dark coloured objects do not reflect IR rays



Basics of Building

Let's understand some basics of building

Tightening Screws

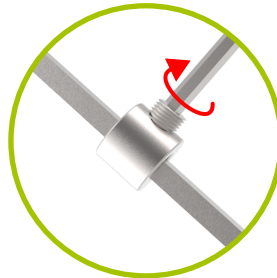
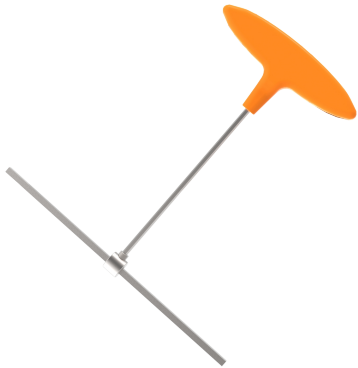


Tighten
(Rotate Clockwise)

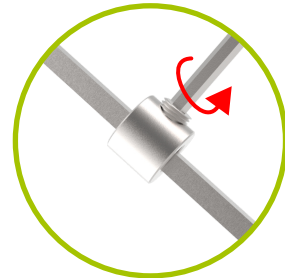


Loosen
(Rotate Anti-clockwise)

Tightening Axle Lock



Tighten
(Rotate Clockwise)

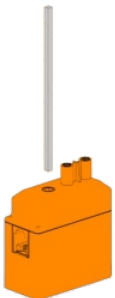


Loosen
(Rotate Anti-clockwise)

Tightening a Motor to a Plate

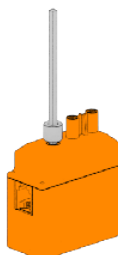
01

Insert Axle



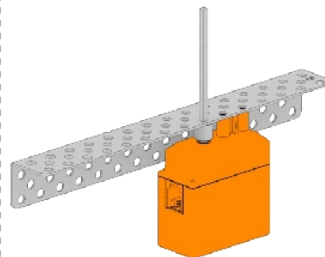
02

Lock Axle Lock



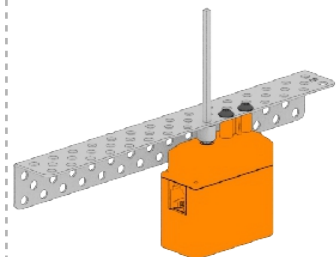
03

Insert Plate



04

Insert Bolts



**Actual metal plate may vary from the image shown but principally will function the same way.*

Attaching Battery to Brain

Let's understand how the Avishkaar Battery is to be attached to the Robotics LITE 2.0 Brain.

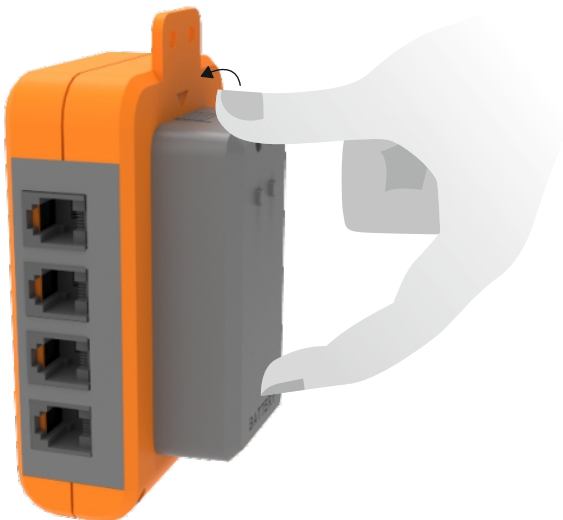
01 Firstly take the Battery and Brain.



02 Angle the lower part of the battery as shown below:



03 Now, push the tab on the top of the battery towards the Brain.



04 After this release the tab on the top of the battery to lock it in a place.



Note: The Avishkaar Battery comes pre-attached to your Robotics LITE 2.0 Brain in the kit. Do not detach the battery unless the construction steps instruct you to attach the battery differently.

Removing Battery from the Brain

Let's understand how the Avishkaar Battery is to be removed from the Robotics LITE 2.0 Brain. It is not necessary for you to do this

01 Firstly take the Battery and Brain.



02 Press the locking tab of the Battery with your thumb & pull it out away from the Brain.



03 Now, disengage the lower tab of the battery.



04 Battery will be removed can keep it safe in the box



Note: The Avishkaar Battery comes pre-attached to your Robotics LITE 2.0 Brain in the kit. Do not detach the battery unless the construction steps instruct you to attach the battery differently.

Congratulations !

Give yourself the 'Familiarize with your Kit' sticker on the Achievement Sheet on Page no.6



Deep Dive into Robotics

Robotics LITE 2.0 Brain Control System

The Robotics Brain can be controlled by 2 types of input methods -

- **Control Method 1 - Avishkaar Remote Control App (ARC)** -
Download the app and use it as a Remote to control your bot.
- **Control Method 2 - Avishkaar Maker Studio (AMS)** -
This is an online software to program your Bot and Make it autonomous.

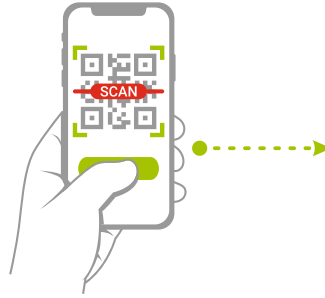


Control Method 1: ARC SETUP

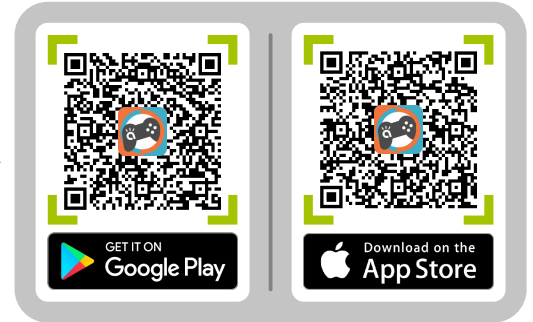


The powerful Avishkaar Remote App, allows for wireless control of robots built with Avishkaar Robotics brains. Connecting wirelessly, children can maneuver their robots in a variety of ways.

1 Scan and Download



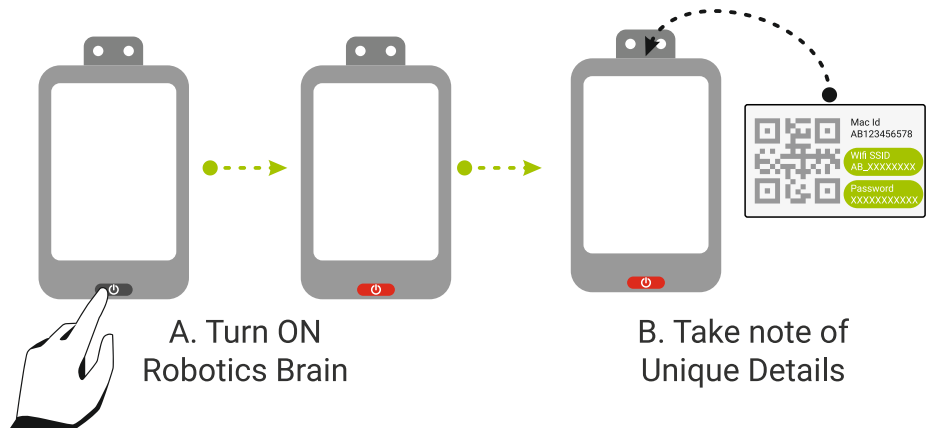
A. Open Camera app or any QR Code scanner



B. Scan the QR codes to visit your device's specific App Store and download the ARC App.

2 Turn ON and Note

- Connect Battery and turn ON the Brain, by pressing and releasing the power button.
- The Button will light up in Red Colour.
- Your Robotis Brain's unique WiFi SSID and WiFi Password, are mentioned on a sticker on the top side of Robotics Brain.



A. Turn ON Robotics Brain

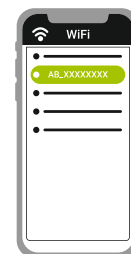
B. Take note of Unique Details

3 Connect via WiFi

- While your device's WiFi is ON, open its WiFi Settings menu and identify your Robotics Brain's WiFi SSID from the listed device options and select it.
- Enter the given password to Connect your phone to the Robotics LITE 2.0 Brain's WiFi



A. Open WiFi Settings



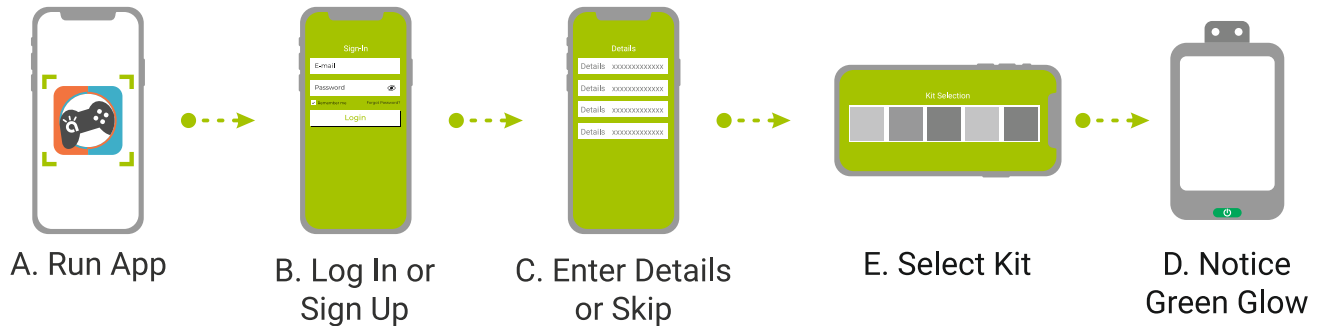
B. Select Robotics Brain



C. Enter Password

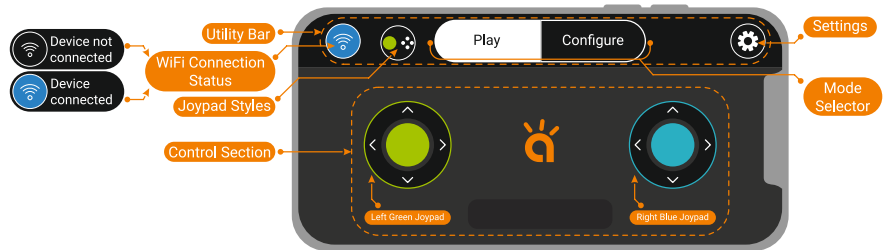
4] Begin using ARC

- Run the ARC App.
- Use your Avishkaar Login Credentials to Sign-In into the App. If you don't have an account, please Sign Up and create one.
- Enter details and select the Robotics Kit with which you are going to play.
- Your Robotics Brain is now in App Mode. Its Power Button begins to glow Green.



5] Explore

The app home screen loads with a Utility Bar and a Control Section. Explore your App.

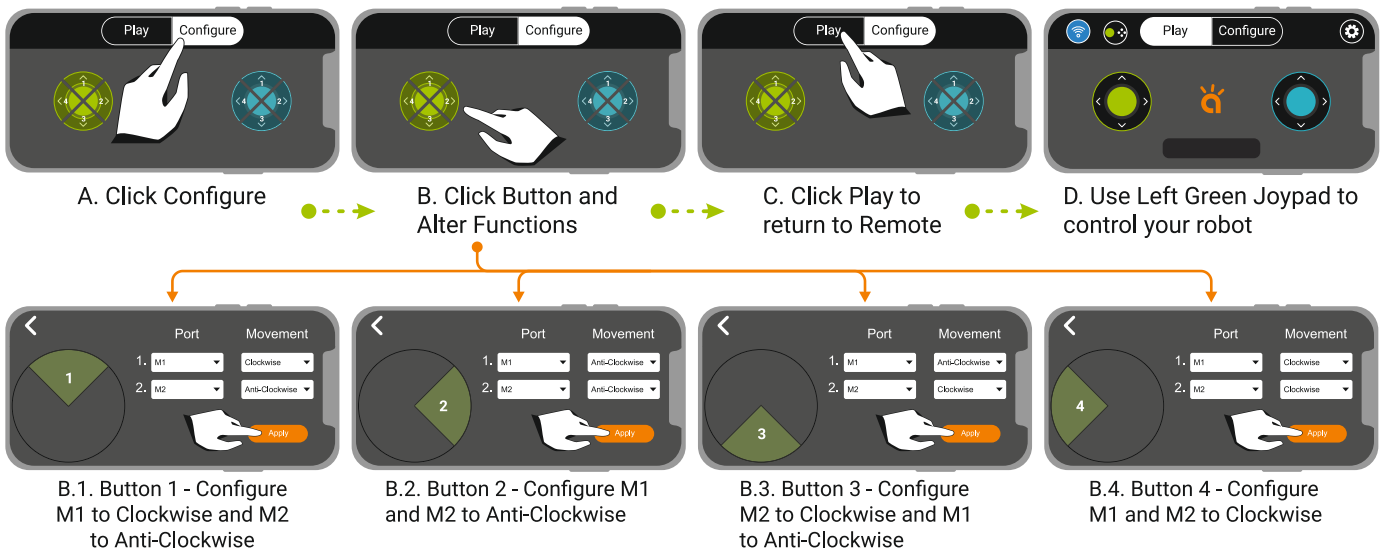


6] Configure

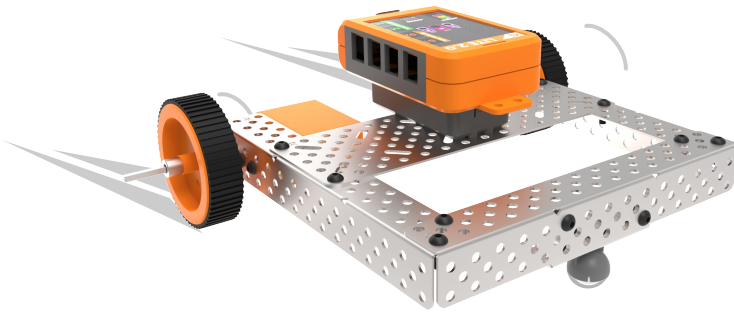
- To begin using the Avishkaar Remote with your Robotics LITE 2.0 Brain, click Configure.
- Click on the Buttons to configure its function.
- Alter the drop down menus of Ports and Movement and Click apply.
- In a sequence configure Buttons 1,2,3 and 4 as shown below.
- Click Play to begin using the configured remote

Note:

- With the Robotics LITE 2.0 Brain, only the Left Green Joypad can be used.
- You can go back to the Configure menu and make alter Port and Movement options, anytime.



Project 1: Race Car



The Avishkaar Race-Car is a fast speeding vehicle that works on two small wheels and one caster wheel.

What is our task?

We have to make a race-car with metal parts, motors, wheel and caster wheels - that races forward in full speed when turned ON.

What will you learn?



Mechanical
Design



Motion



Axle Support



Friction/Momentum

What will you need?



Robotics LITE
2.0 Brain x 1



Battery x 1



Caster Wheel
x 1



3.5" Axle x 2



Wheel x 2



High Speed
Motor x 2



2.5" L-Channel x 1



7.5" L-Channel
x 3



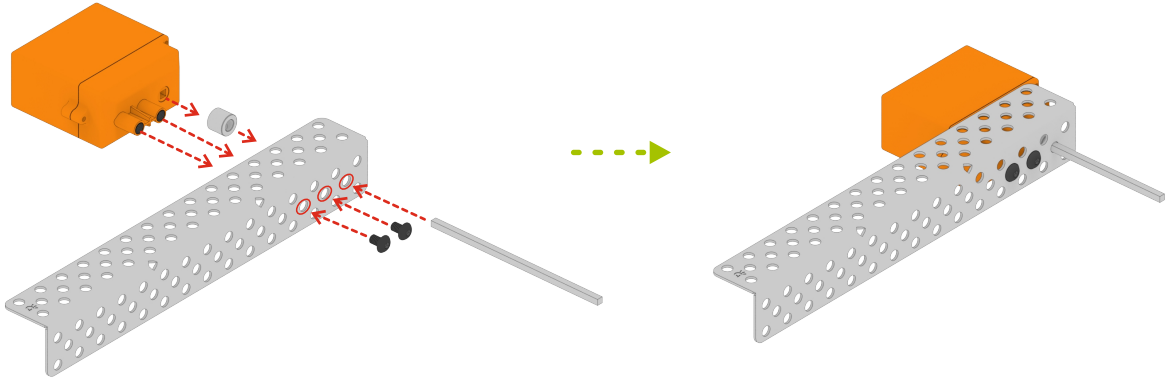
7.5" Rectangular
PLate x 1



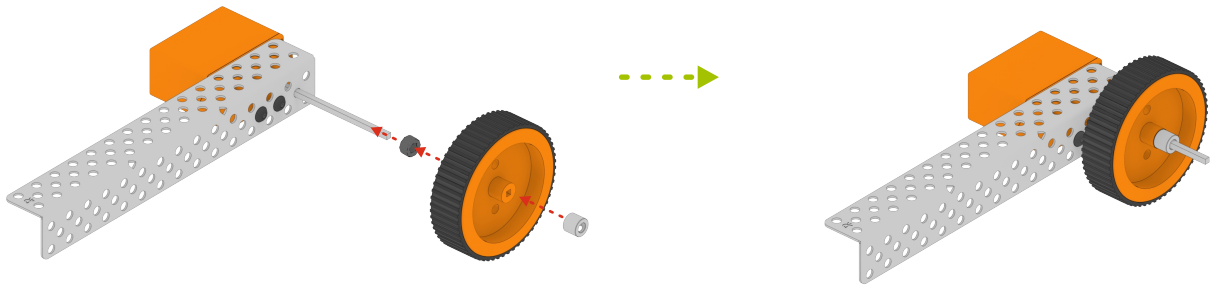
Nuts and Bolts

Let's Build!

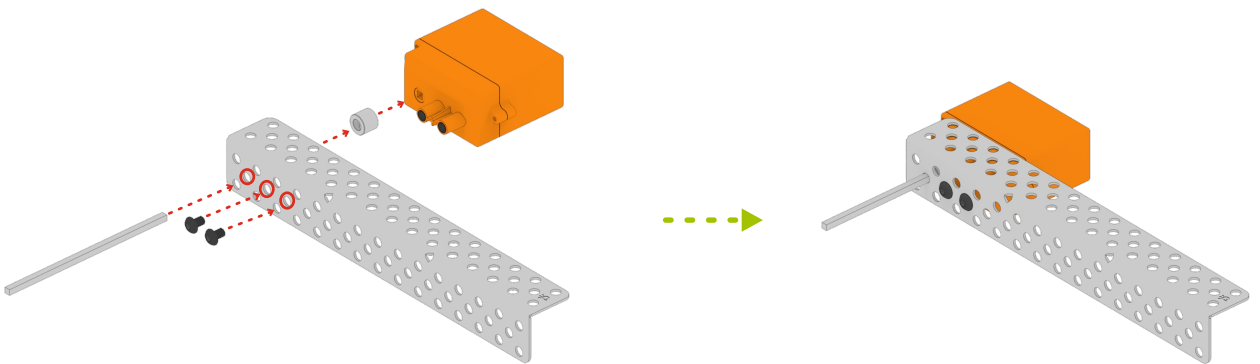
- 1 Connect a High Speed Motor, 3.5" Axle and Axle Lock to a 7.5" L-Channel, using 6 mm bolts, as shown below.



- 2 Insert a Filler, Wheel and Axle Lock on the 3.5" Axle, as shown below. Once inserted tighten the Axle Lock in place, to secure the Wheel.

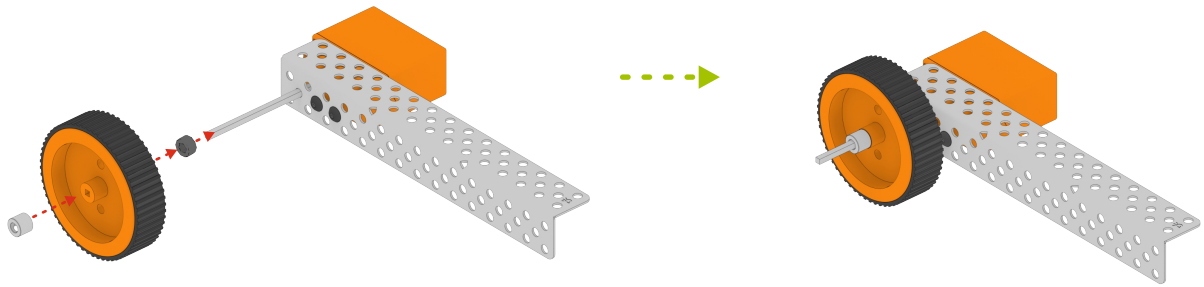


- 3 Make another assembly for the other side. Connect another High Speed Motor, 3.5" Axle and Axle Lock to another 7.5" L-Channel, using 6 mm bolts, as shown below.



4

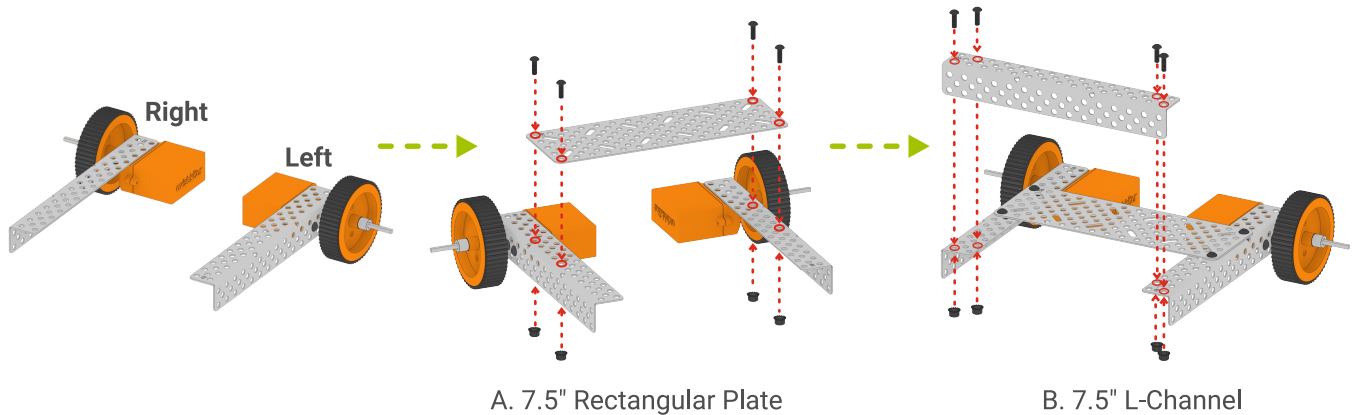
On the second assembly, insert a Filler, Wheel and Axle Lock on the 3.5" Axle, as shown below. Once inserted tighten the Axle Lock in place, to secure the Wheel.



5

Connect the Right and Left Assemblies -

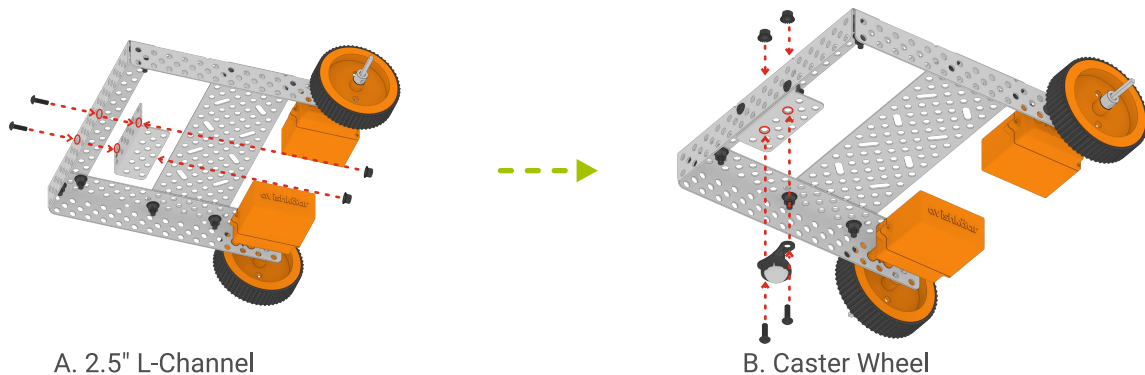
- With a 7.5" Rectangular Plate using 12 mm bolts and K-nuts, as shown below.
- With a 7.5" L-Channel, using 12 mm bolts and K-nuts, as shown below.



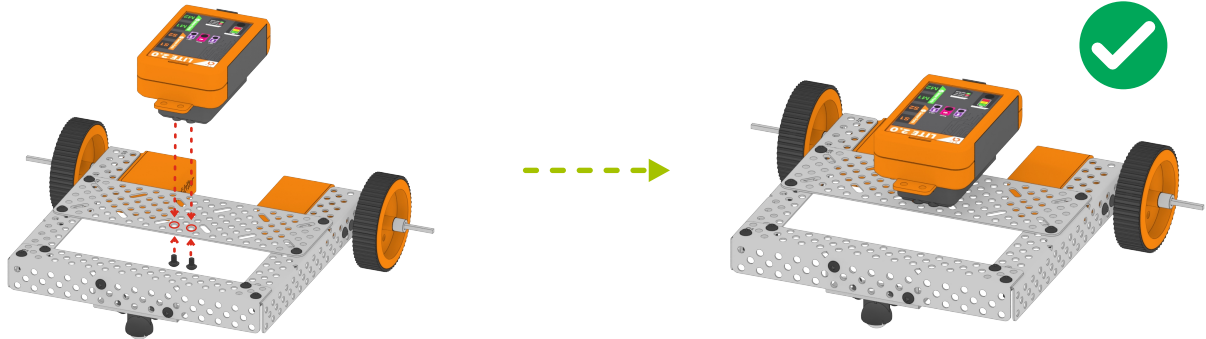
6

Connect -

- A 2.5" L-Channel, using 12 mm bolts and K-nuts, as shown below.
- A Caster Wheel, using 12 mm bolts and K-nuts, as shown below.



- 7 Attach the Robotics LITE 2.0 Brain with Avishkaar battery to the 7.5" Rectangular Plate using 6 mm bolts, to complete your Robot.

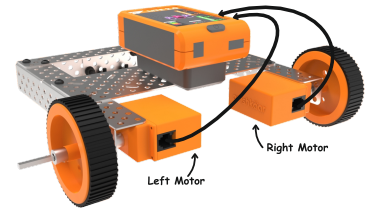


Woohoo your first bot is ready!

Lets Play!

Setup

- Connect Right High Speed Motor to M1, using the connecting cable.
- Connect Left High Speed Motor to M2, using the connecting cable.
- Turn ON the Robotics LITE 2.0 Brain
- Open the ARC App and Connect the Robotics LITE 2.0 Brain to it.



How to Play



- Play with Remote Controller
- For instructions on ARC download, installation and configuration, refer to Pg. no. 18.

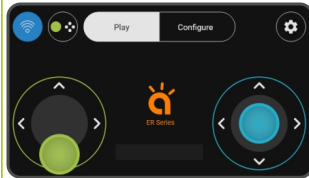
Move Forward

When we push the Left Joystick forward, the bot moves forward.



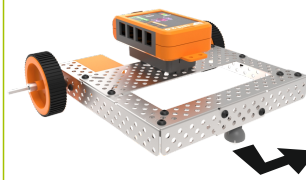
Move Backward

When we push the Left Joystick backward, the bot moves backward.



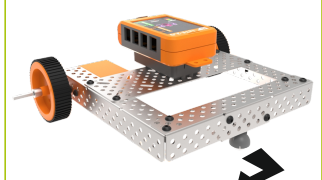
Move Left

When we push the Left Joystick towards the left, the bot turns left.



Move Right

When we push the Left Joystick towards the right, the bot turns right.



Congratulations !
Give yourself the 'First Project
Badge' sticker on your
Achievement Sheet on Pg. no. 6

Project 2: Construction Site



What is our task?

We have to make a Motorized Construction Site Lift to understand the workings of a Pulley, using the metal parts, motor and pulley.

What will you learn?



Sensor
Interfacing



Logic
Building



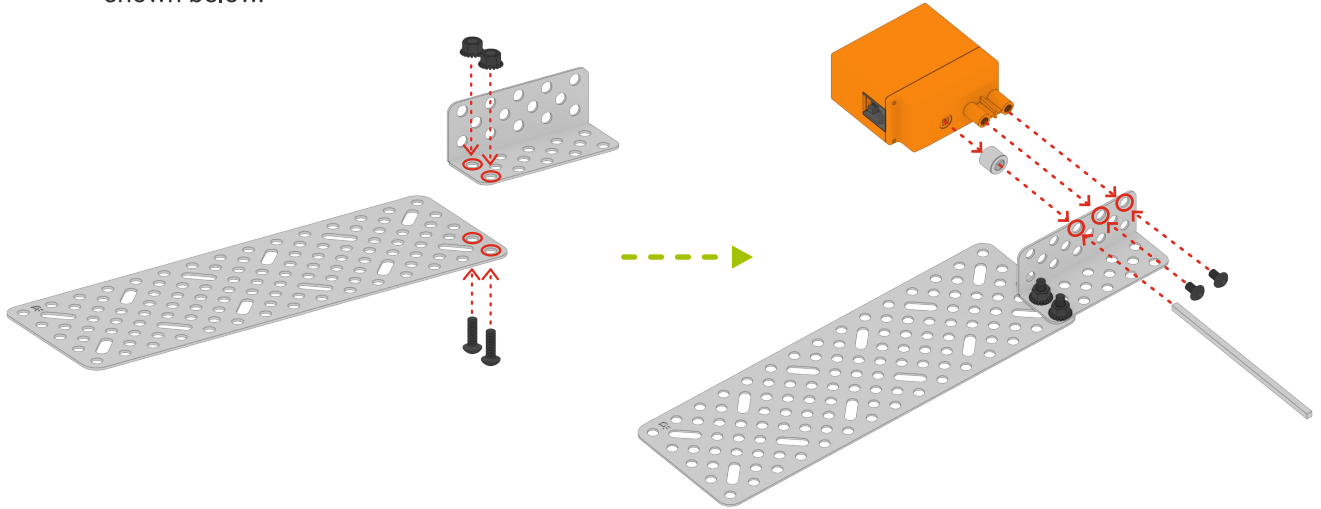
Mechanical
Design

What will you need?

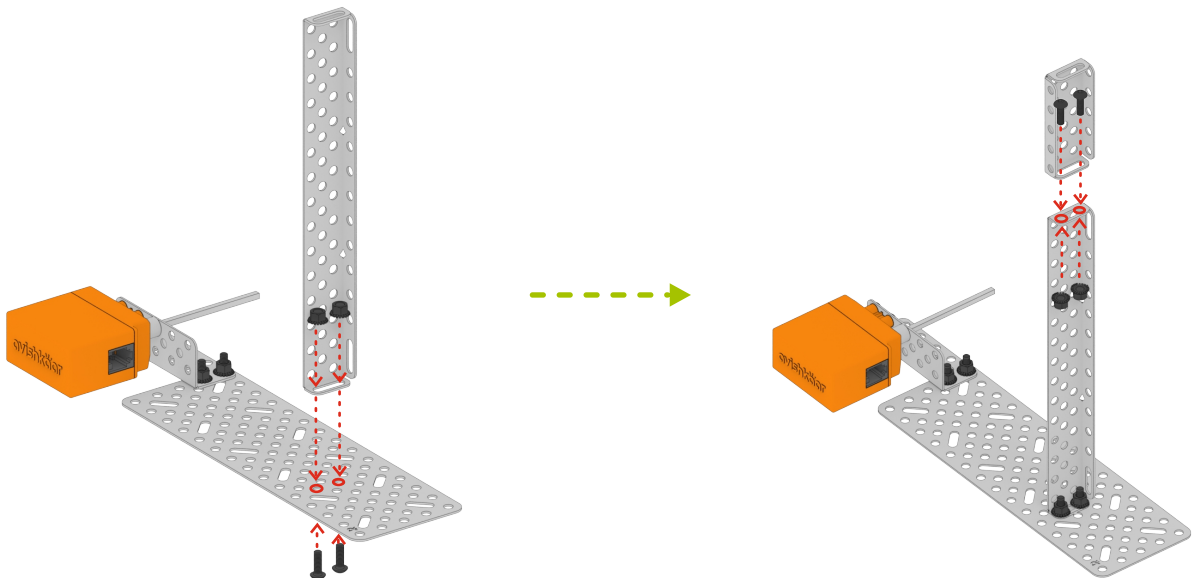
 Robotics LITE 2.0 Brain x 1	 Battery x 1	 Caster Wheel x 1	 3.5" Axle x 2
 Wheel x 2	 High Speed Motor x 2	 2.5" L-Channel x 1	 7.5" L-Channel x 3
 7.5" Rectangular PLate x 1	 IR Sensor x 1	 Nuts and Bolts	

Let's Build!

- 1 • Connect the 2.5" L-Channel to the 7.5" Rectangular Plate, using 12 mm Bolts and K-nuts, as shown below.
 - Attach a High Speed Motor and a 3.5" Axle to the 2.5" L-Channel using Axle Lock and 6 mm bolts as shown below.

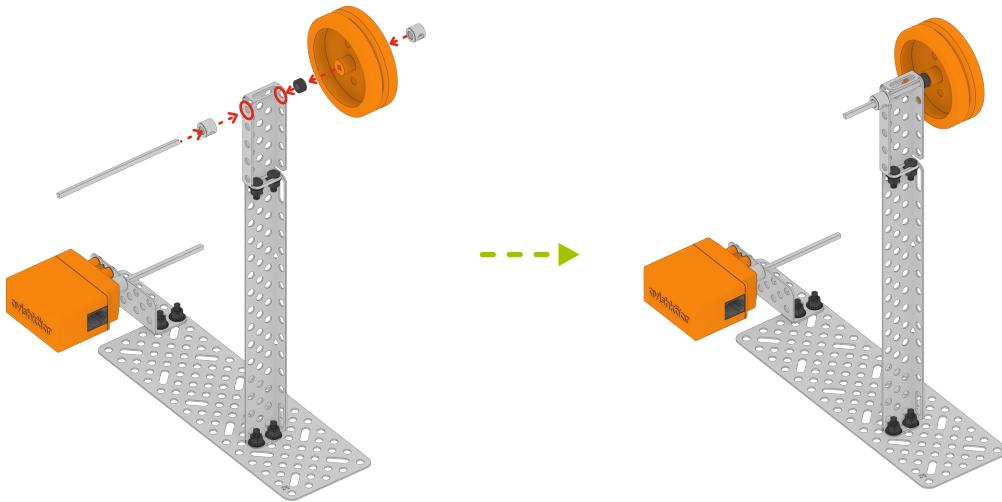


- 2 • Attach a 7.5" L-Beam to the 7.5" Rectangular Plate using 12 mm bolts and K-nuts, as shown below.
 - Attach a 2.5" U-Beam to the 7.5" L-Beam using 12 mm bolts and K-nuts, as shown below.



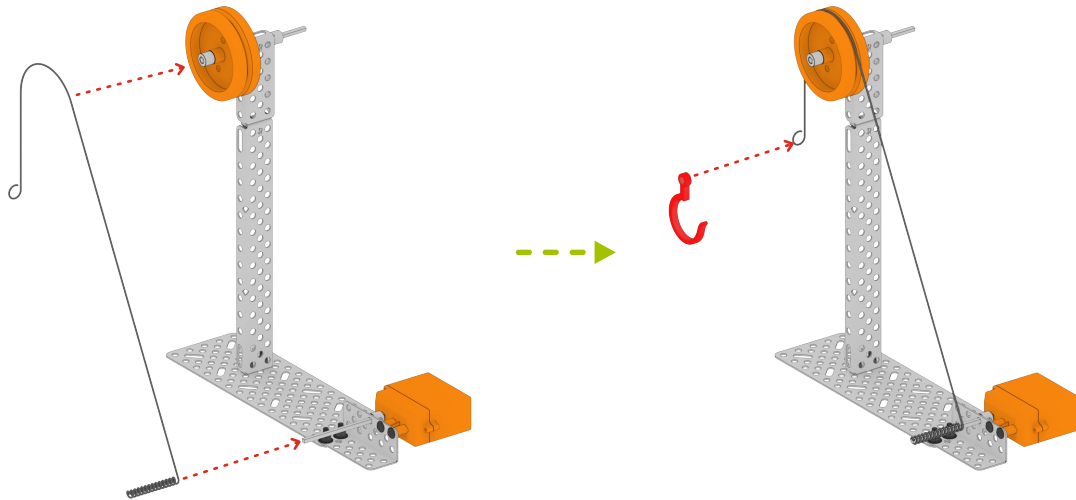
3

- Insert a 3.5" Axle through the 2.5" U-Beam and insert the wheel on the axle and remove its Tyre Tread from the wheel to use it like a Pulley.
- Insert Axle locks on both sides, and tighten the Axle Locks to Fix the Pulley in place.



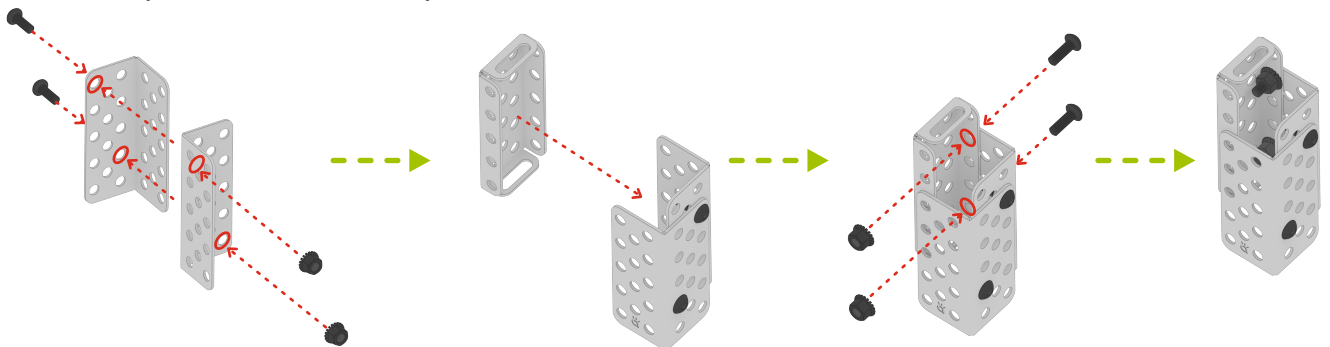
4

- Tie a thread around the Pulley and the 3.5" Axle as shown below.
- Tie one end of the thread with the Red Plastic Hook as shown below.



5

- First attach 2X 2.5" L-Channel together using 12 mm Bolts and K-Nuts, as shown below.
- Insert a 2.5" U-Beam into place as shown below.
- Fix the 2.5" U-Beam to the 2.5" L-Channel using 12 mm bolts and K-Nuts , as shown below.
- Payload for the Lift is ready.



A. Attach 2.5" L-Channels

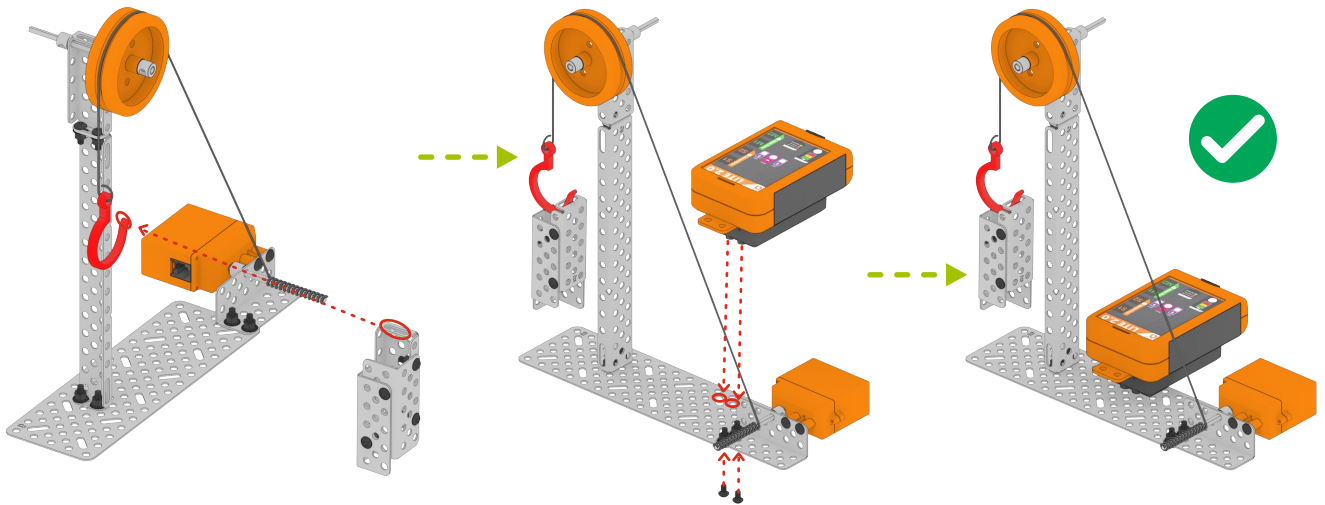
B. Insert 2.5" U-Beam

C. Fix 2.5" U-Beam

D. Payload

6

- Hang the Payload onto the Red Plastic Hook.
- Attach the Robotics LITE 2.0 Brain with Avishkaar Battery to the 7.5" Rectangular Plate as shown below
- Your Bot is complete.



Woohoo your bot is ready!

Lets Play!

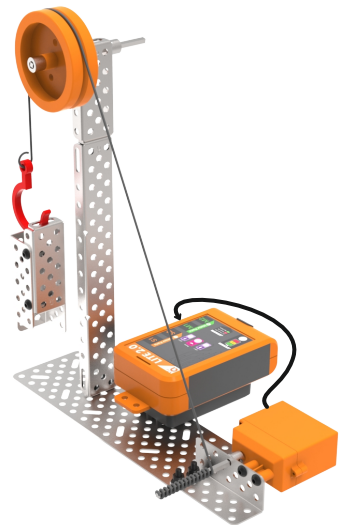
Setup

- Connect Right High Speed Motor to M1, using the connecting cable.
- Turn ON the Robotics LITE 2.0 Brain
- Open the ARC App and Connect the Robotics LITE 2.0 Brain to it.

How to Play

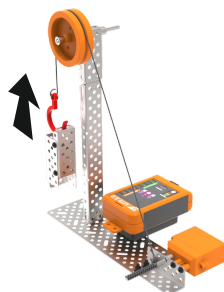
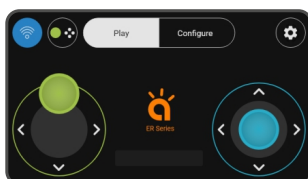


- Play with Remote Controller
- For instructions on ARC download, installation and configuration, refer to Pg. no. 18.



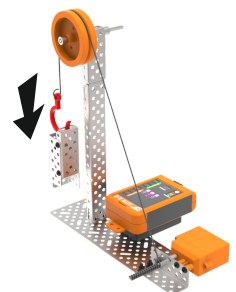
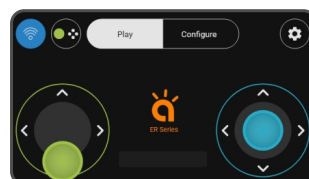
Move Upwards

When we push the left joystick forward, the bot moves upward.



Move Upwards

When we push the left joystick backward, the bot moves downward.



Control Method 2:AMS & ABT SETUP

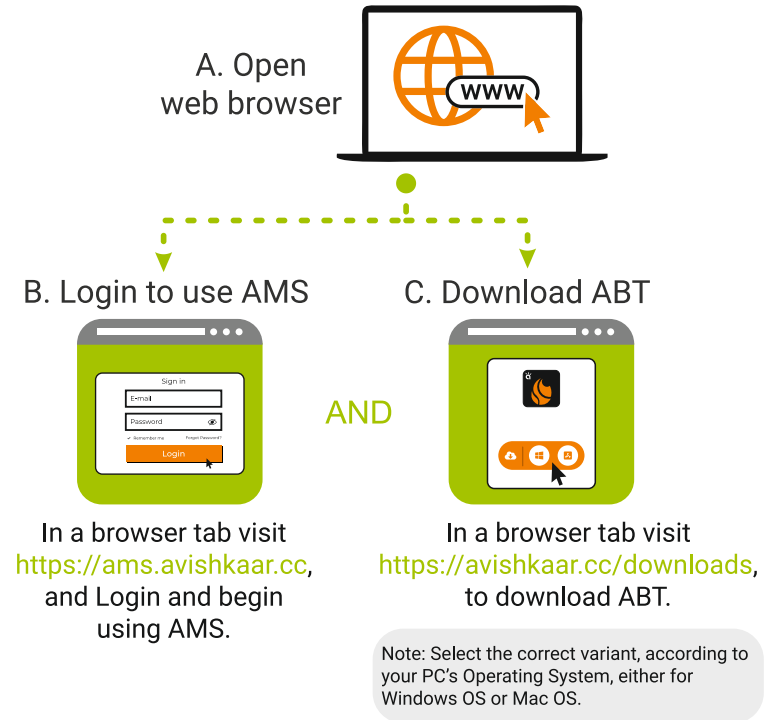


Avishkaar Maker Studio (AMS) is an Integrated Development Environment to program the Avishkaar Robotics Brains in your Kit



AMS Burn Tool (ABT) is an Utility software, used to Burn the codes that are downloaded from AMS online, into the Avishkaar Robotics Brain in your Kit.

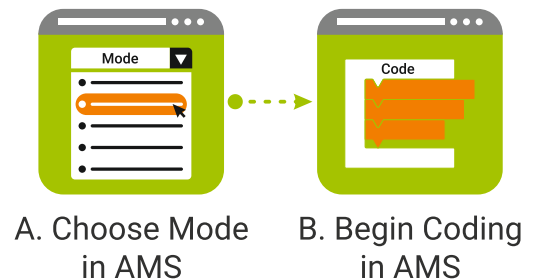
1 Login and Download



2 AMS Mode & Making Code

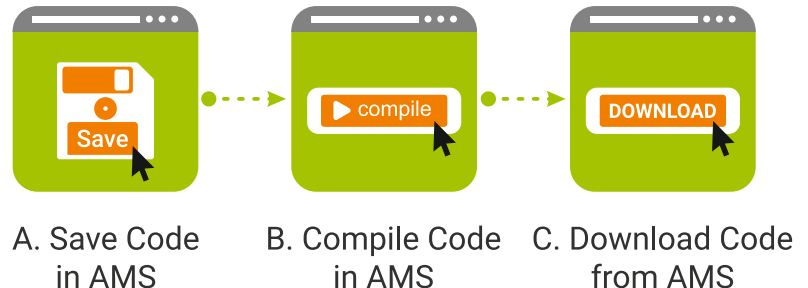
- In the AMS tab, choose the correct mode from the Menu for the brain in your kit.
- Begin Creating your Code using the Blocks from the various Contexts tabs.

Note: All the blocks in a particular context are in a unique colour so they are easy to find.

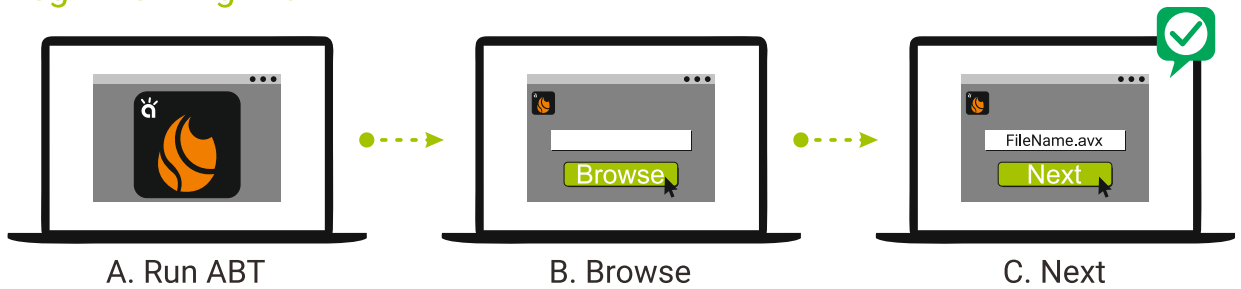


3 Save, Compile and Download Code

- In AMS after making your code, add a name and then Save it.
- Then Compile your code making it ready to burn.
- Now the code is ready to be Download and Burned onto your Robotics Brain using AMS Burn Tool (ABT).



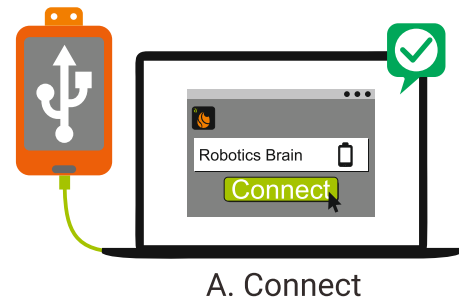
4 Begin Burning with ABT



- Run ABT.
- Browse for the location of the downloaded code as an .avx file and select it for burning onto your Robotics Brain.
- Click on Next to move to the next stage.

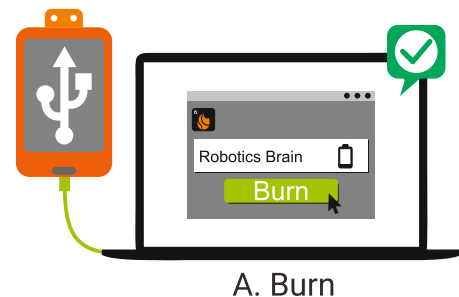
5 Connect

Connect your Robotics Brain to your PC using the USB Programming Cable. ABT will automatically detect the Brain. Click on Connect, to prepare the Brain for the burning process.



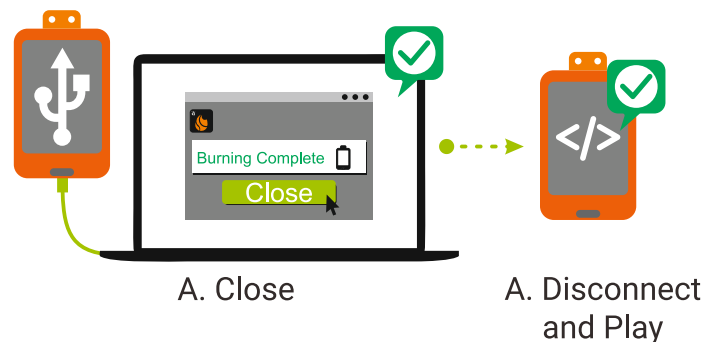
6 Burn

Click on Burn to start the process of uploading your Code to your Robotics Brain.

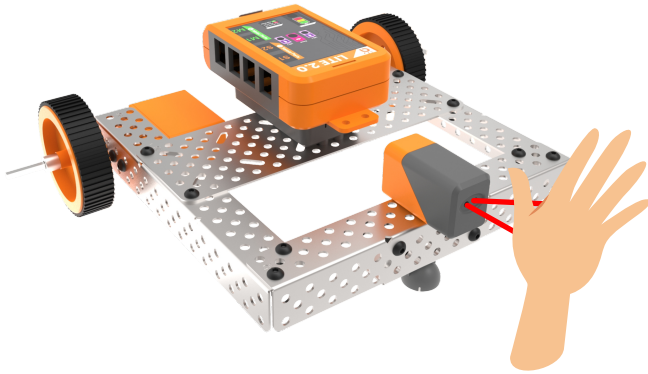


7 Close, Disconnect and Play

- Once the code is burnt onto the Robotics Brain, a success message appears. Now your brain will begin Running the Program.
- You can Close ABT , Disconnect your Robotics Brain and Play Test the code with your robot.



Project 3: Hand-Follower



Hand-Follower is a smart robot that uses an IR-Sensor and follows your hand when it is placed in front of the sensor.

What is our task?

We have to make a hand-follower with metal parts, motor, wheels and an IR sensor that follows a hand when it is placed in front of the IR sensor.

What will you learn?



Sensor
Interfacing

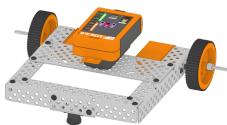


Logic
Building



Mechanical
Design

What will you need?



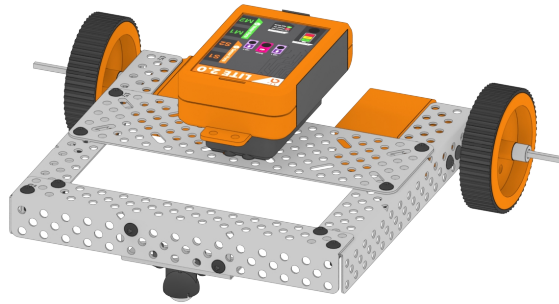
Race Car Project (completely
assembled project) x1



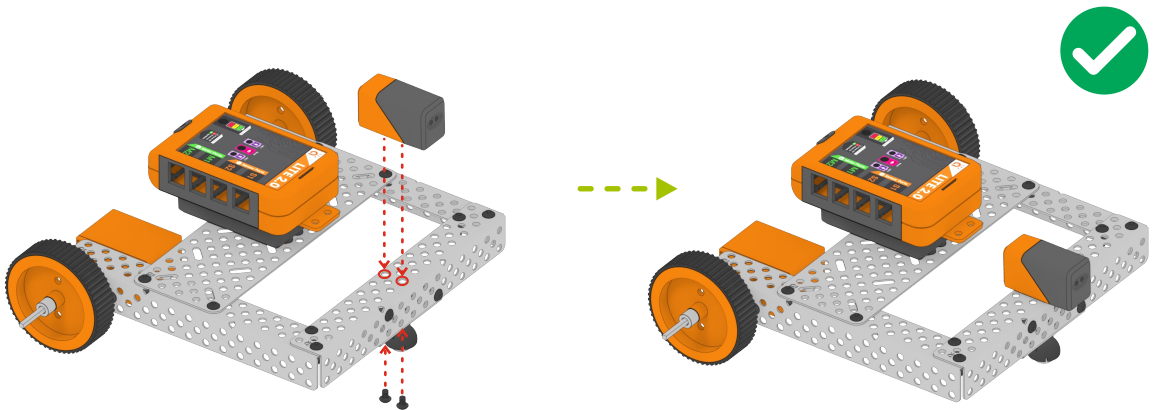
IR Sensor x 1

Let's Build!

- 1
 - Refer to RC Car from Step 1 to Step 7 from page no. 21 to 23.
 - Your model should look like this.



- 2
 - Attach the IR Sensor to the 7.5" L-Channel using 6 mm bolts, as shown below.
 - Your Bot is ready to be coded !

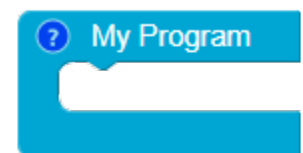


Woohoo your bot is ready!

Let's Code !

New Coding Concepts

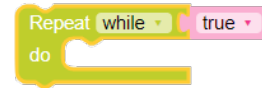
- 1 **My Program Block**
 - Any program you want to write will always start with this block.
 - Entire code will be written inside My Program Block.



2

Repeat While Block

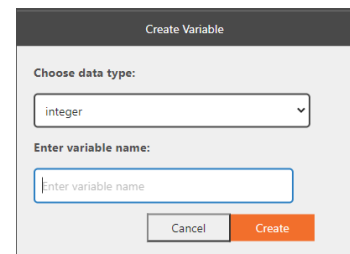
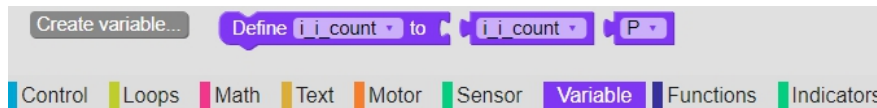
- Repeat while block is a Looping block that is used to execute a set of statements multiple times. Repeat while block has two variations - for finite looping and for infinite looping.
- A conditional block needs to be attached to the repeat block on the right. If the block is simply a constant "true", then the loop is infinite and the enclosed statements execute continuously.
- If the condition is created using logical or relational operator blocks as defined above, then the set of enclosed instructions are executed until the condition is true, then we can achieve a finite loop. If we miss updating this and the condition is always true, then the loop is executed infinitely



3

Create, Define and Storing Value in variable

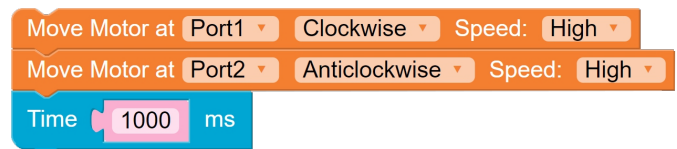
- Click on create variable block under Variable context and a window will open up as shown below.
- Choose the data type and a name for the variable and click Create.
- A variable will be created in the Variable context. Just like "i_count" and "i_i_name" in the image below.
- Now these created variables can be called in the program directly to store values.



4

Motor Blocks used as Output for a Certain Time

To set up any motor movement for a certain time, set the motor movement using Move Motor Block and then select time in millisecond for which the motion must be executed using Time block in Control context.



Eg. Set the motor movement to move in Forward direction for 1000 ms i.e 1 sec.

5

Read Touch Sensor Block

Read Touch Sensor Block - reads the value of Avishkaar Touch Sensor on the defined port. You can perform any particular task on the basis of touch input and select the port to which your sensor is connected. The values on which Avishkaar Touch sensor works are as shown on the right.

Read Touch Sensor at Port1 ▾

Sensor is pressed	Returns value >500
Sensor is not pressed	Returns value <500

6

Read IR Sensor block

Read IR Sensor Block - reads the value of Avishkaar Infrared sensor on the defined port. You can perform any particular task on the basis of Infrared inputs which senses black and white spots and select the port in which your sensor is connected. The values on which Avishkaar IR sensor works are shown on the right.

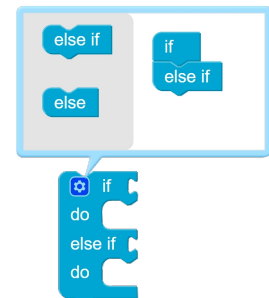
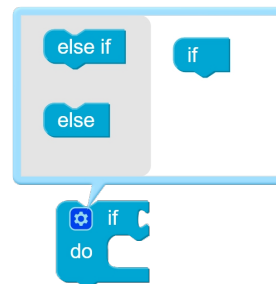
Read IR Sensor at Port1 ▾

Black (Dark Coloured Objects)	Returns value <350
White (Light Coloured Objects)	Returns value >350

7

IF and ELSE IF Loop

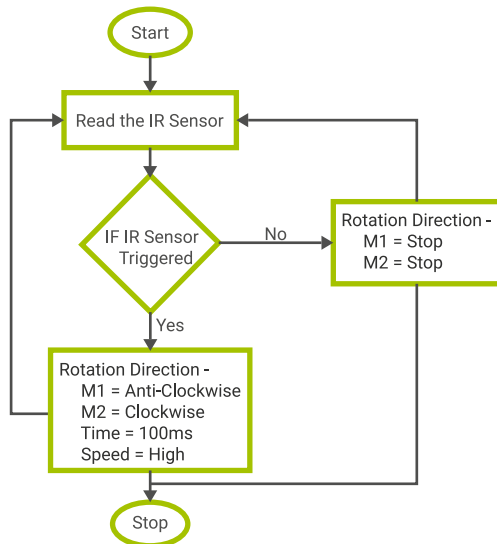
- If block is a condition block which checks the condition given and if it is found to be 'True', i.e. the condition passes, it enters the control structure to execute do statement. If however, the condition fails or is 'false' the do statement block will not be executed.
- If you want to execute multiple conditions then - click on  icon on the top left of the If block which lets you add Else block and Else If block.
- You can select and drag which type of block you require for your condition statement, and even multiple if needed.
- **If- Else** and **If- Else If** block allows you to define two different set of statements out of which only one is executed based on the condition, If the condition of the if block is found to be 'true' then the set of statements of if-block are executed and if the condition is found to be 'false' then the statements under else or else-if block get executed.



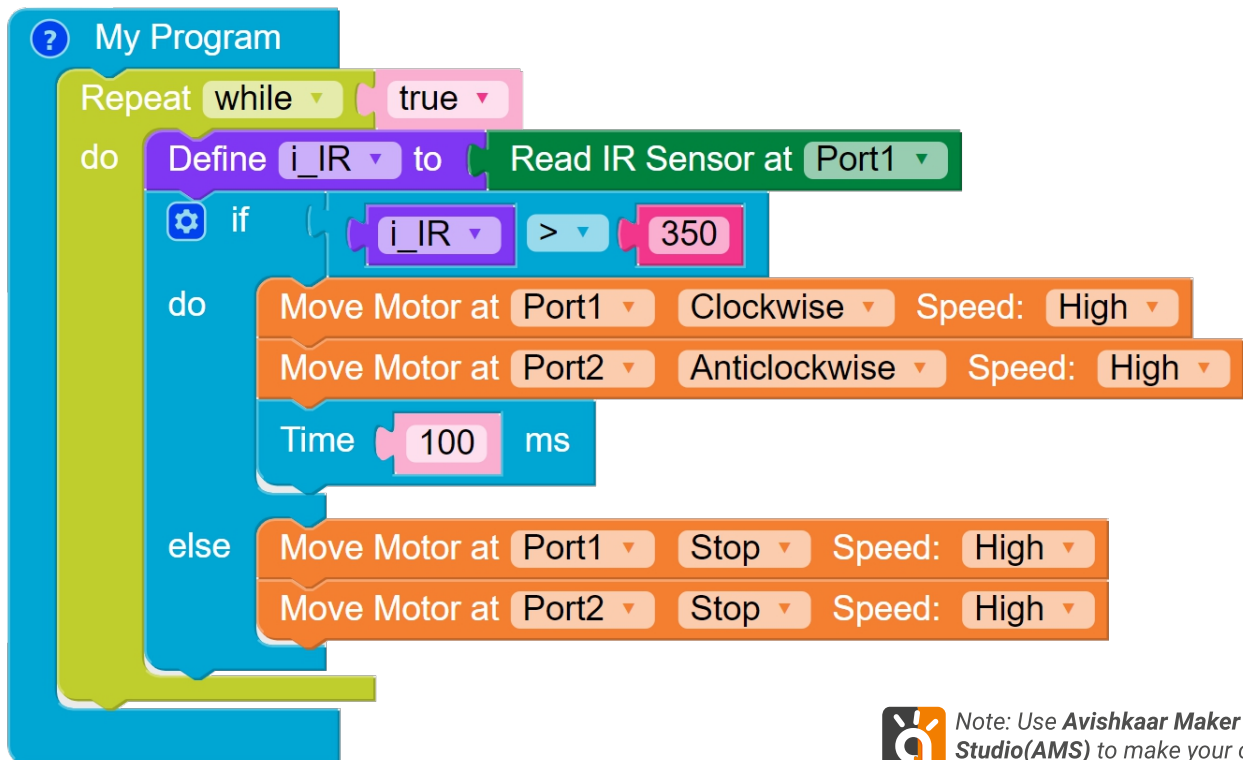
Understanding the Algorithm

1. Read the values generated by the IR sensor.
2. Process the values by sensors as:
 - a. If IR sensor shows values - Move the bot Forward by setting 1 motor to rotate clockwise and another as Anticlockwise
 - b. If no values are detected, stop both the motors.

Logic Flowchart



Final Code



Lets Play!

Setup

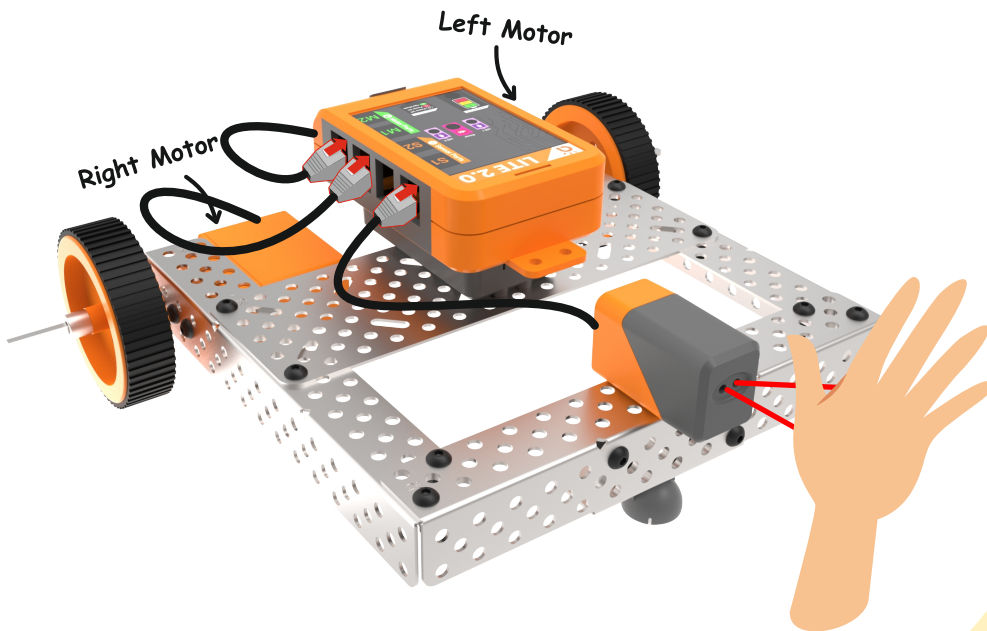
- Connect Right High Speed Motor to M1, using the connecting cable.
- Connect Left High Speed Motor to M2, using the connecting cable.
- Connect the IR Sensor to Port S1, using the connecting cable.
- Turn ON the Robotics LITE 2.0 Brain



- Make your Code on Avishkaar Maker Studio (AMS).
- Burn the Code to the LITE 2.0 Brain using AMS Burn Tool (ABT)
- For instructions on AMS and ABT download, installation and usage, refer to Pg. no. 28.

How to Play

Interact with the Robot by placing your hand in front of the Sensor and watch the Robot React to the movement of your Hand



Explore on your own

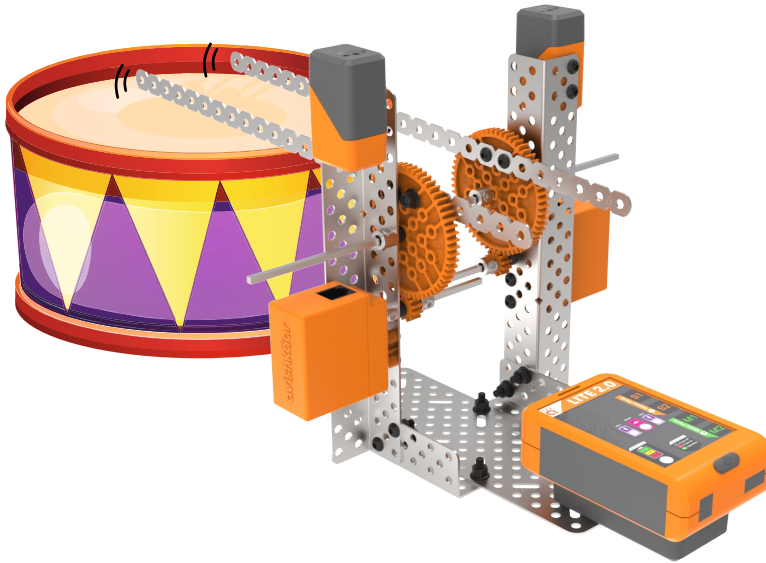
Modify the code to make a robot that can move backward when a object is in range of IR sensor, i.e. the Hand Repeller.



Congratulations !

Give yourself the 'Third Project Badge' sticker on your Achievement Sheet on Pg. no. 6

Project 4: Drummer



Drummer is a fun musical robot that has two arms as drumsticks connected to two IR sensors, to create beats.

What is our task?

We have to make a drummer with two arms and IR Sensors where the arms hits the drum and makes a beat everytime we bring our hand in front of the respective IR Sensor.

What will you learn?



Sensor
Interfacing



Recoil
Mechanism



Gear System



Mechanical
Design



Tech in Art

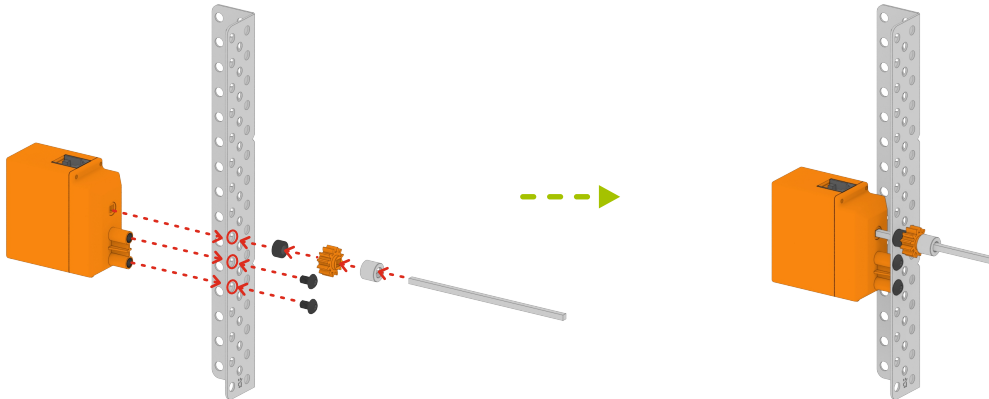
What will you need?

 Robotics LITE 2.0 Brain x 1	 Battery x 1	 5.5" Axle x 2	 3.5" Axle x 2
 Small Spur Gear x 2	 Big Spur Gear x 2	 High Speed Motor x 2	 2.5" L-Channel x 2
 7.5" L-Channel x 2	 7.5" Rectangular Plate x 1	 12.5" Flexi x 2	 3 Hole Connector X 2
 IR Sensor x 2	 Nuts and Bolts		

Let's Build!

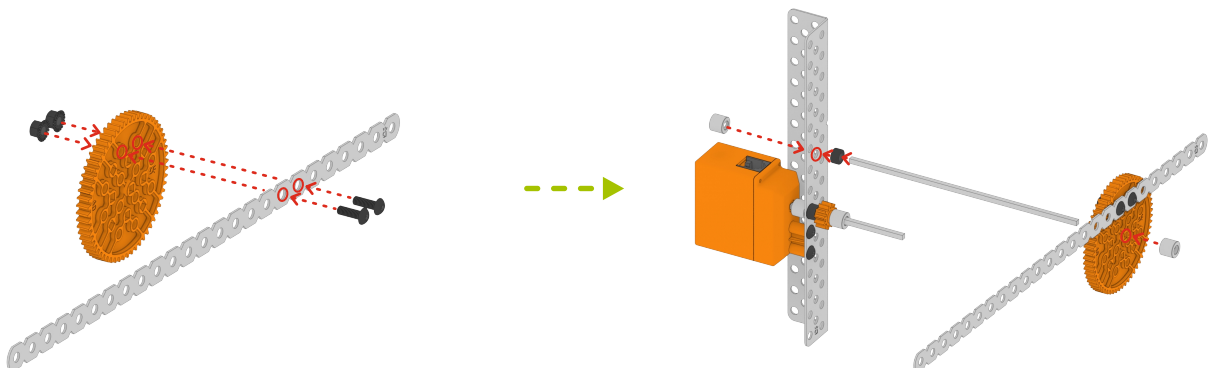
1

- To build the Right Pillar, attach a High Speed Motor and a 3.5" Axle to a 7.5" L-Channel using 6 mm bolts, as shown below.
- Insert a Filler Small Spur Gear and Axle Lock onto the shaft, as shown below.
- Tighten the Axle lock in place to secure the Small Spur Gear.



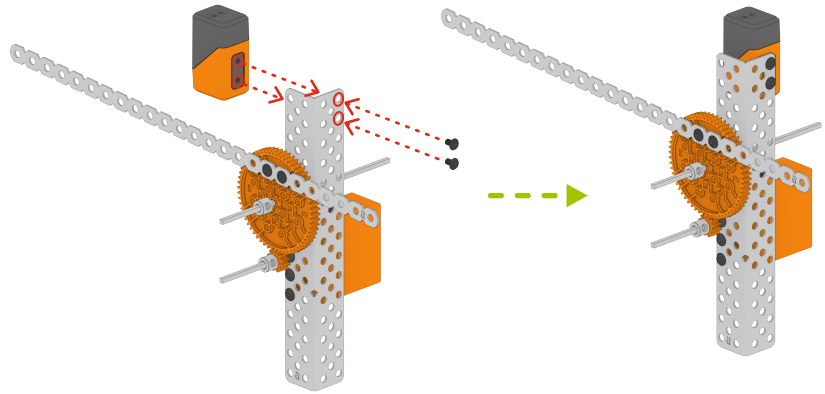
2

- To build the Right Drum Stick, attach a Big Spur Gear to a Large Flexi using 12 mm Bolts and K-Nuts, as shown below.
- Insert the Right Drumstick on 5.5" Axle, passing through the Right Pillar, with a Filler and 2x Axle Locks, as shown below. Make sure the teeth of the Small and Big Spur Gear are interlocking.
- Tighten the Axle locks in place to secure the Right Drum Stick.



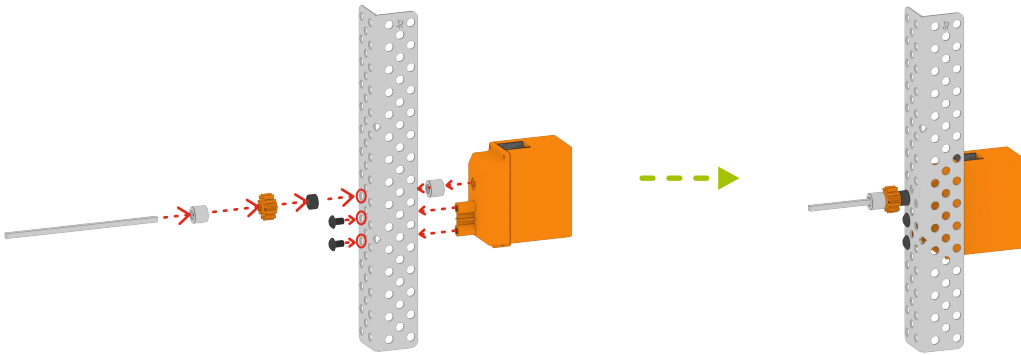
3

- Attach a IR sensor to the Right Pillar using 6 mm bolts, as shown.
- Your Right Drum Stick Pillar assembly is complete.



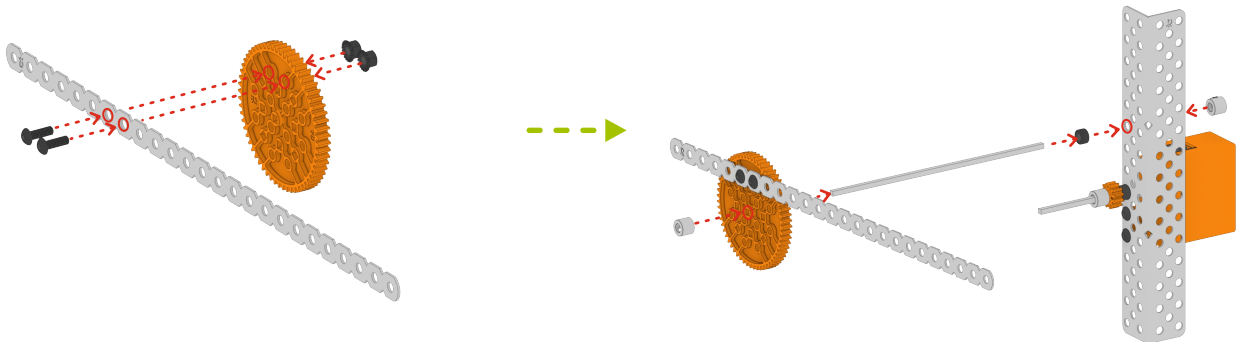
4

- To build the Left Pillar, attach a High Speed Motor and a 3.5" Axle to a 7.5" L-Channel using 6 mm bolts, as shown below.
- Insert a Filler Small Spur Gear and Axle Lock onto the shaft, as shown below.
- Tighten the Axle lock in place to secure the Small Spur Gear.



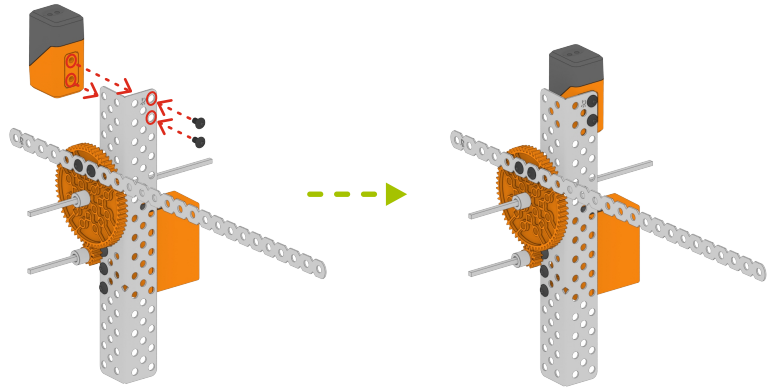
5

- To build the Left Drum Stick, attach a Big Spur Gear to a Large Flexi using 12 mm Bolts and K-Nuts, as shown below.
- Insert the Right Drumstick on 5.5" Axle, passing through the Right Pillar, with a Filler and 2x Axle Locks, as shown below. Make sure the teeth of the Small and Big Spur Gear are interlocking.
- Tighten the Axle locks in place to secure the Right Drum Stick.



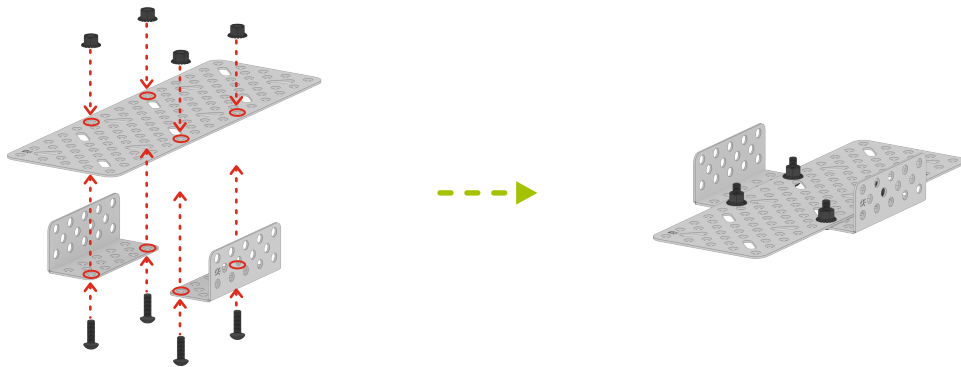
6

- Attach a IR sensor to the Right Pillar using 6 mm bolts, as shown below.
- Your Right Drum Stick assembly is complete.



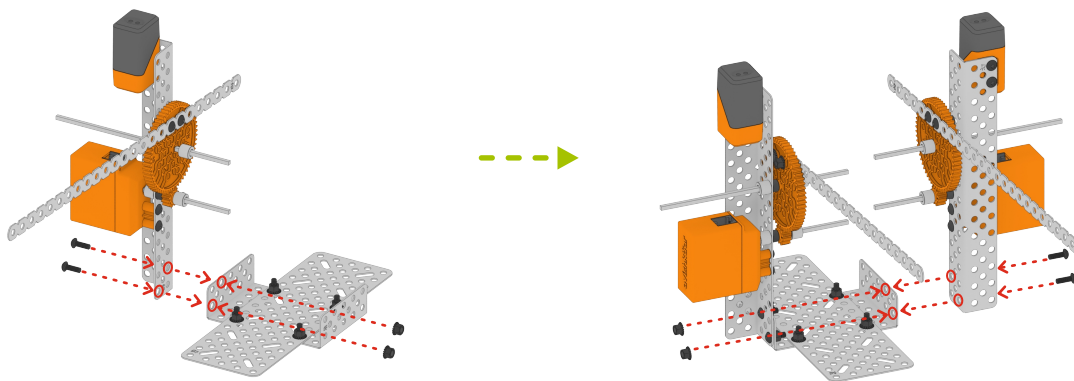
7

- To Build the Base, attach 2x 2.5" L-Channels to a 7.5" Rectangular Plate using 12 mm bolts and K-Nuts as shown below.



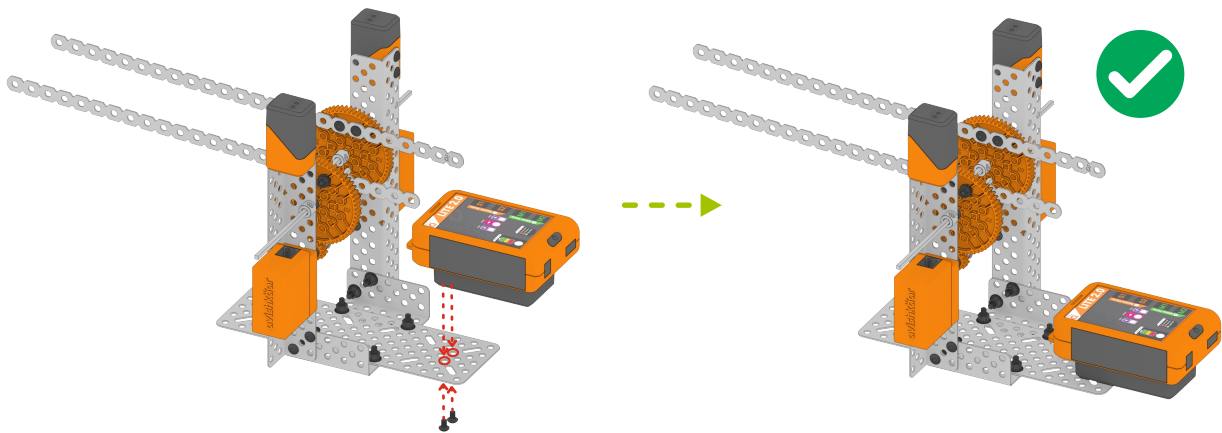
8

- Attach the Right Drum Stick Pillar assembly to the right 2.5" L-Channel of the Base using 12 mm Bolts and K-Nuts as shown below
- Attach the Left Drum Stick Pillar assembly to the left 2.5" L-Channel of the Base using 12 mm Bolts and K-Nuts as shown below



9

- To complete your Bot attach the Robotics LITE 2.0 Brain with Avishkaar Battery to the 7.5" Rectangular Plate of the Base using 6 mm Bolts, as shown below.



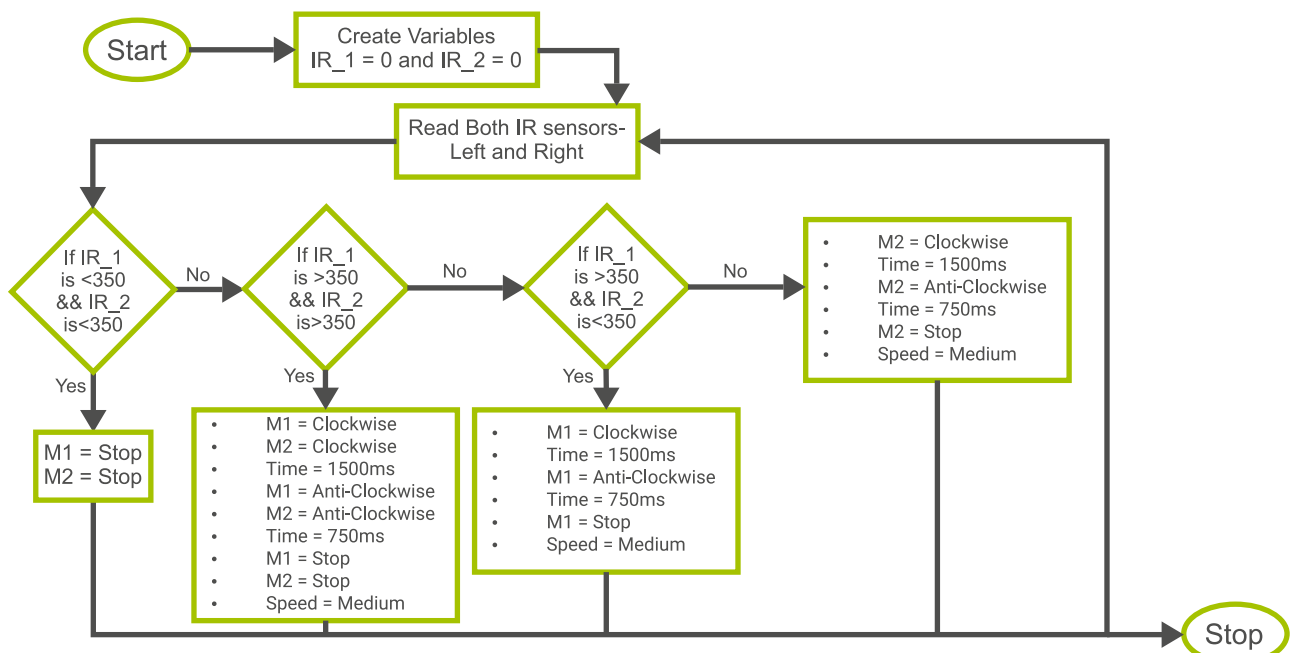
Woohoo your bot is ready!

Let's Code !

Understanding the Algorithm

- Read the values generated by the IR sensor.
- Process the values by sensors as:
 - If only IR sensor 1 returns values, the motor at Port 1 will be controlled
 - If only IR sensor 2 returns values, the motor at Port 2 will be controlled
 - If both IR sensor 1 and IR Sensor 2, return values, the motors at Port 1 and Port 2 will be controlled
 - If no values from either sensors are returned, the motors at both Port 1 and Port 2 will be stopped

Logic Flowchart



Final Code

My Program

```
Define i_IR-1 to 0
Define i_IR-2 to 0
Repeat while true
do
  Define i_IR-1 to Read IR Sensor at Port1
  Define i_IR-2 to Read IR Sensor at Port2
  if i_IR-1 < 350 && i_IR-2 < 350
  do
    Move Motor at Port1 Stop Speed: High
    Move Motor at Port2 Stop Speed: High
  else if i_IR-1 > 350 && i_IR-2 > 350
  do
    Move Motor at Port1 Clockwise Speed: Medium
    Move Motor at Port2 Clockwise Speed: Medium
    Time 1500 ms
    Move Motor at Port1 Anticlockwise Speed: Medium
    Move Motor at Port2 Anticlockwise Speed: Medium
    Time 750 ms
    Move Motor at Port1 Stop Speed: Medium
    Move Motor at Port2 Stop Speed: Medium
  else if i_IR-1 > 350 && i_IR-2 < 350
  do
    Move Motor at Port1 Clockwise Speed: Medium
    Time 1500 ms
    Move Motor at Port1 Anticlockwise Speed: Medium
    Time 750 ms
    Move Motor at Port1 Stop Speed: Medium
  else
    Move Motor at Port2 Clockwise Speed: Medium
    Time 1500 ms
    Move Motor at Port2 Anticlockwise Speed: Medium
    Time 750 ms
    Move Motor at Port2 Stop Speed: Medium
```



Note: Use **Avishkaar Maker Studio(AMS)** to make your code.

Lets Play!

Setup

- Connect Right High Speed Motor to M1, using the connecting cable.
- Connect Left High Speed Motor to M2, using the connecting cable.
- Connect the Right IR Sensor to S1, using the connecting cable.
- Connect the Left IR Sensor to S2, using the connecting cable.
- Turn ON the Robotics LITE 2.0 Brain



• Make your Code on Avishkaar Maker Studio (AMS).

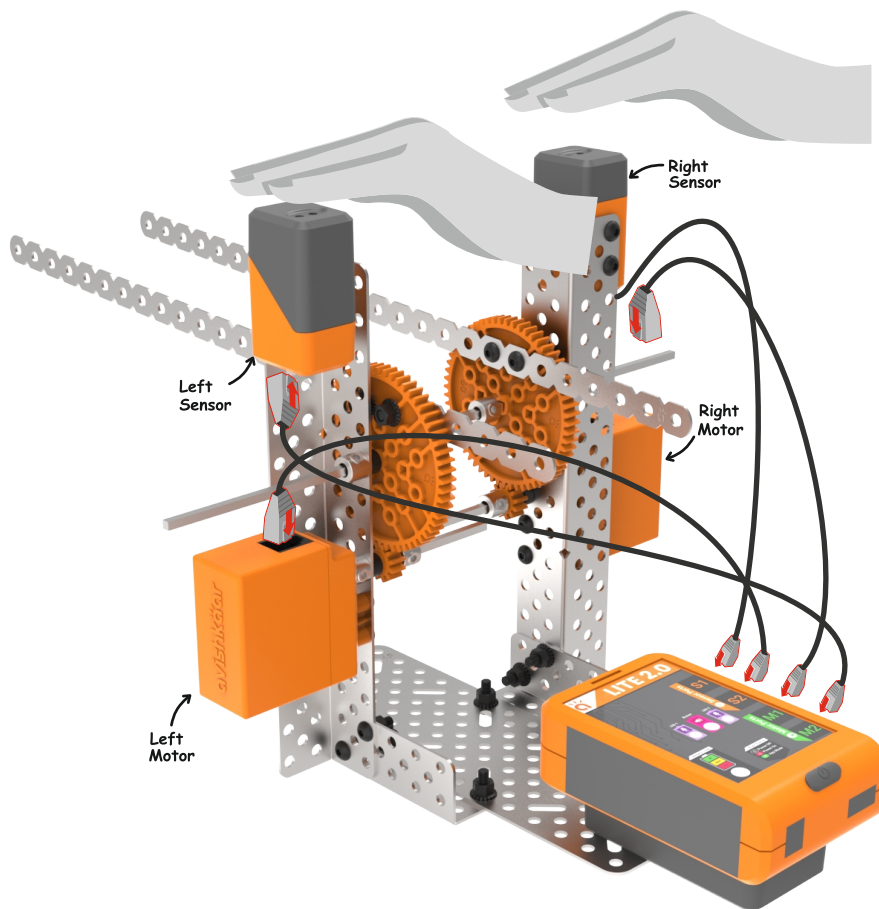


• Burn the Code to the LITE 2.0 Brain using AMS Burn Tool (ABT)

• For instructions on AMS and ABT download, installation and usage, refer to Pg. no. 28.

How to Play

Interact with the Robot by placing your hands on top of the IR Sensors and watch the Robot React to the movement of your Hand. Place a Steel Bowl for the Drumsticks to Strike on and enjoy playing with an Air Drummer.



Explore on your own

You can program the IR sensor input to the buzzer's tone output to make an air piano (contact less piano), Just assign different frequency tones to make Sa, Re, Ga, Ma, Pa...

Project 5: Smart Table Fan



A Smart Table Fan is a portable fan that can be turned ON and OFF by pressing the Touch sensor.

What is our task?

We have to make a smart table fan with metal parts, gears, motors, and Touch Sensor that turns ON the fan when pressed first and then increases the speed when it is pressed again.

What will you learn?



Sensor
Interfacing



Smart
Devices



Gear System



Mechanical
Design



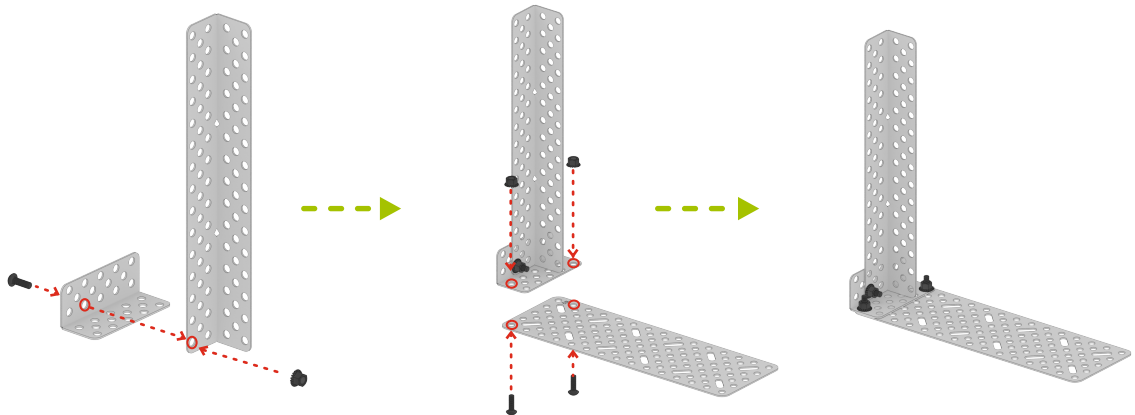
Gesture Control

What will you need?

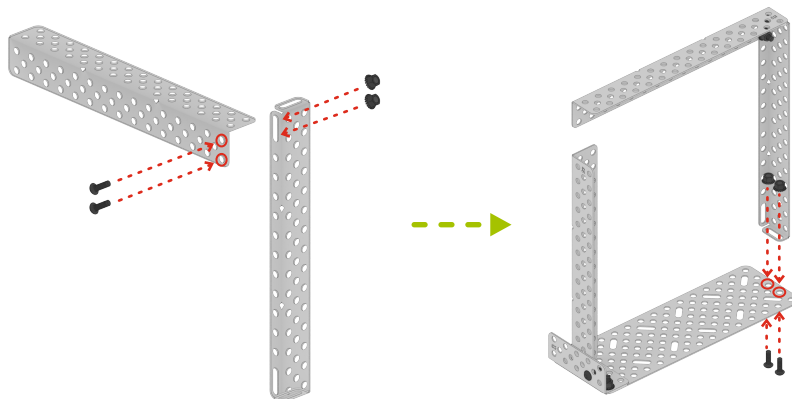
 Robotics LITE 2.0 Brain x 1	 Battery x 1	 5.5" Axle x 1	 3.5" Axle x 1
 Small Spur Gear x 1	 Big Spur Gear x 1	 High Speed Motor x 1	 2.5" L-Channel x 1
 7.5" L-Channel x 2	 7.5" Rectangular Plate x 1	 12.5" Flexi x 2	 7.5" L-Beam x 2
 Touch Sensor x 1	 Nuts and Bolts		

Let's Build!

- 1 • Begin by attaching a 2.5" L-Channel to a 7.5" L-Channel using 12 mm Bolts and K-Nuts, as shown Below
- Attach a 7.5" Rectangular Plate to the 2.5" L-Channel using 12 mm Bolts and K-Nuts, as shown Below

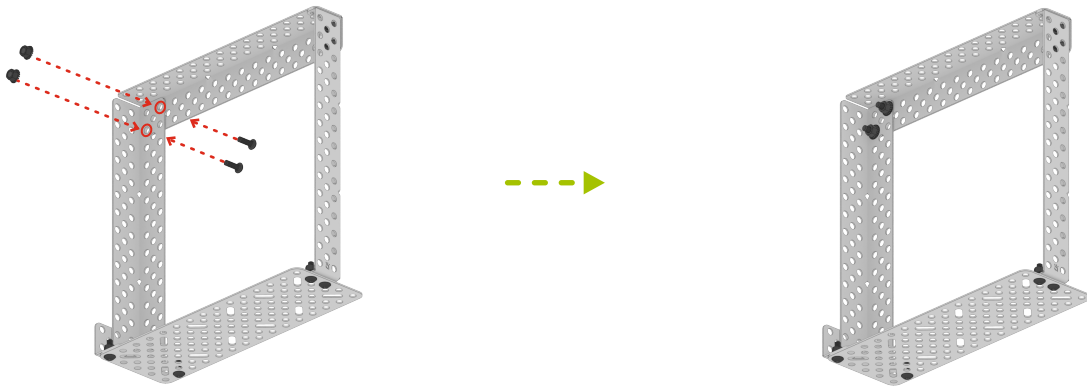


- 2 • Attach another 7.5" L-Channel to a 7.5" L-Beam using 12mm Bolts and K-Nuts, as shown below
- Attach the 7.5" L-Beam to the 7.5" Rectangular plate using 12mm Bolts and K-Nuts, as shown below.



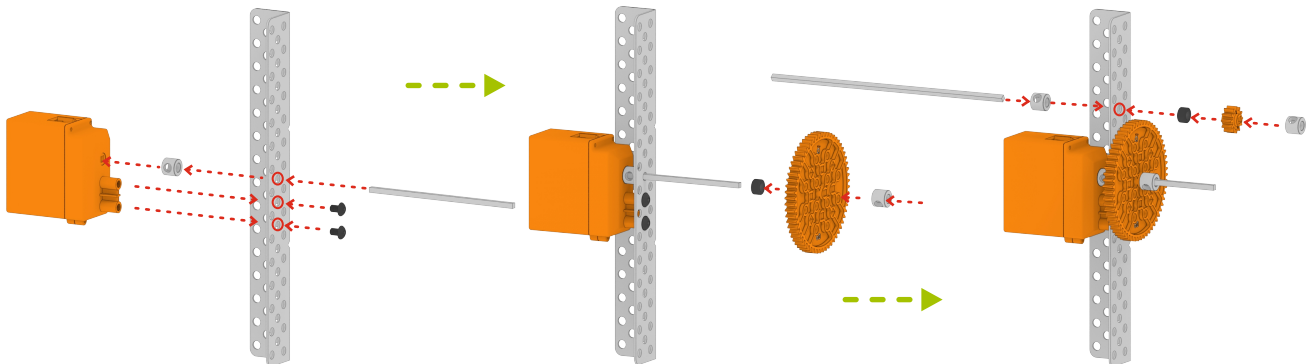
3

- Fasten the 2 L-Channels together using 12 mm Bolts and K-Nuts as shown below, to complete the Base Frame



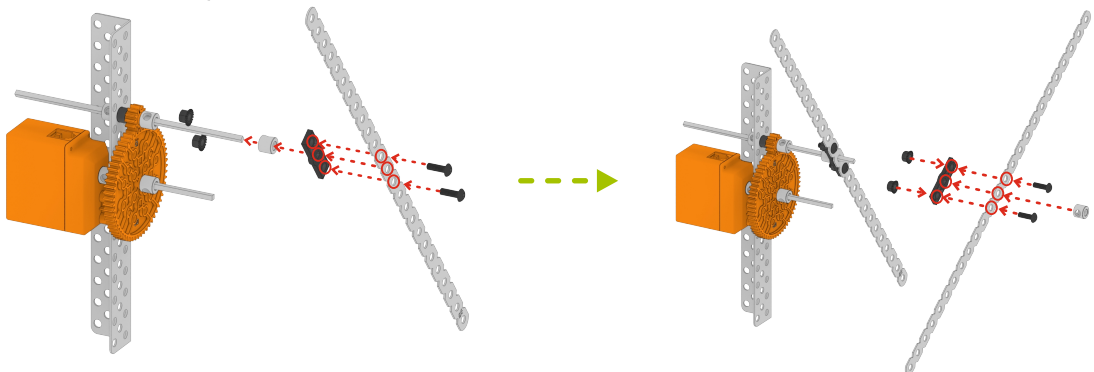
4

- To Build Fan Pillar, attach High Speed Motor, Axle Lock and 3.5" Axle to a 7.5" L-Channel using 6 mm Bolts.
- Insert a Big Spur Gear on to the 3.5" Axle with a filler and Axle Lock. Tighten the Axle Lock to secure the Gear in place.
- Insert a 5.5" Axle into the L-Channel with 2x Axle Locks, a Filler and a Small Spur Gear and tighten Axle locks in place to secure the gear. Ensure that the teeth of both the gears are interlocking.



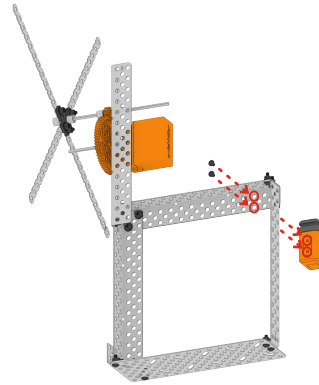
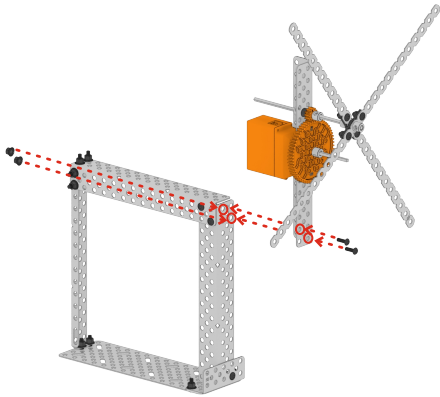
5

- Attach a three hole connector to a Large Flexi with 12mm bolts and K-Nuts as shown to make a Fan Blade.
- Insert the Large Flexi with a three hole connector and a Axle Lock onto the 5.5" Shaft. Tighten the Axle lock to define the first blade's position.
- Construct another Fan Blade using a Large Flexi and a three hole connector, fastened together using 12 mm bolts and K-Nuts.
- Insert the second blade onto the 5.5" Axle along with an Axle Lock. Tighten Axle Lock in place to secure the blades in place.



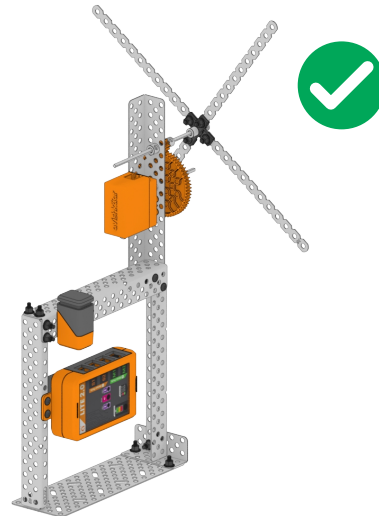
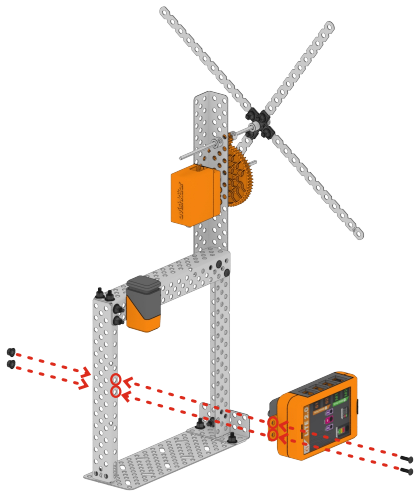
6

- Connect the 7.5" L-Channel from the Fan Pillar assembly to the 7.5" L-Channel of the Base Frame using 12mm bolts and K-Nuts, as shown below.
- Attach a Touch Sensor to the Base Frame using 6 mm Bolts, as shown below.



7

- Attach the Robotics LITE 2.0 Brain with Avishkaar Battery to the 7.5" L-Beam of the Base frame using 12 mm Bolts and K-Nuts, as shown below.
- Your Bot is ready !



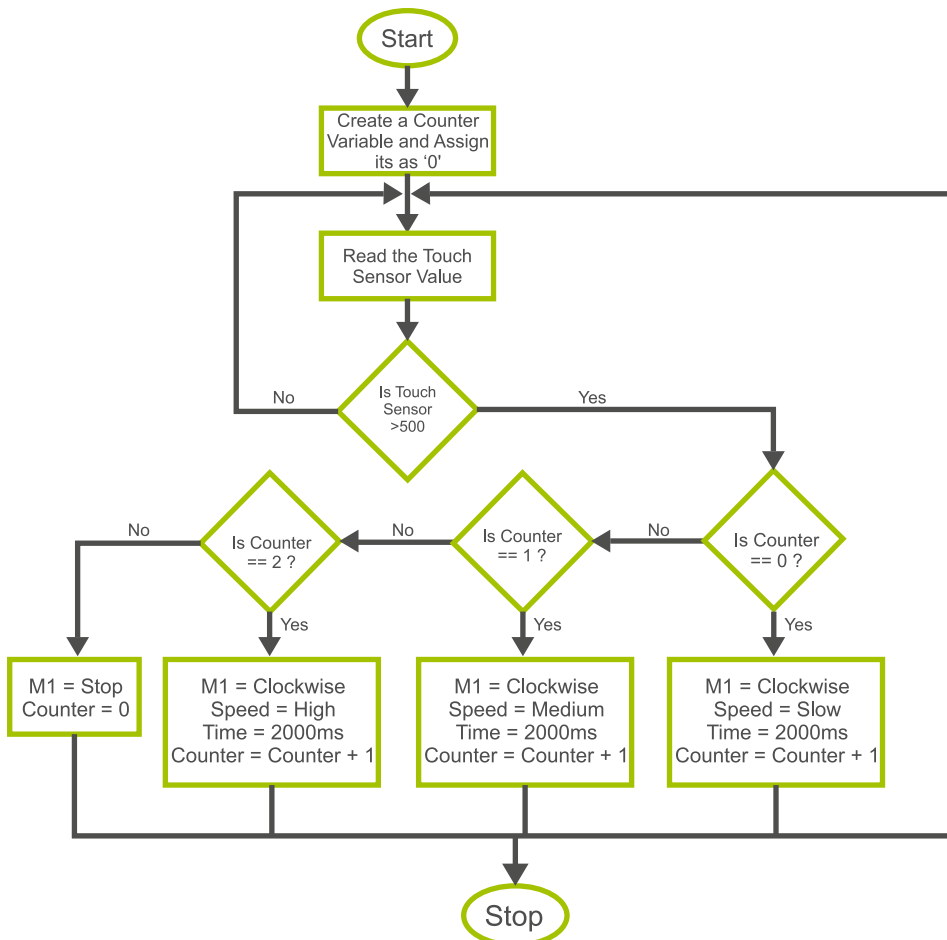
Woohoo your bot is ready!

Let's Code !

Understanding the Algorithm

1. Define a variable to keep count for how many times a user Triggers the Touch Sensor and set it as
2. Process the Touch values with initial value of Counter as '0':
 - a. If the Touch Sensor is triggered first time, it will increase the counter by '1' and the motor at Port 1 will move at Slow Speed.
 - b. If the Touch Sensor is triggered again, a second time, it will increase the counter by '1' and the motor at Port 1 will move at Medium Speed.
 - c. If the Touch Sensor is triggered again, a third time, it will increase the counter by '1' and the motor at Port 1 will move at High Speed.
 - d. If the Touch Sensor is triggered again for a fourth time, it will reset the counter to '0' and the motor at Port 1 will Stop.

Logic Flowchart



Final Code

```
graph TD
    subgraph "My Program"
        direction TB
        A[Define i_counter to 0] --> B[Define i_TouchSensorVal to 0]
        B --> C[Repeat while true]
        C --> D[Define i_TouchSensorVal to Read Touch Sensor at Port1]
        D --> E[if i_TouchSensorVal > 500]
        E --> F[if i_counter == 0]
        F --> G[Move Motor at Port1 Clockwise Speed: Slow]
        G --> H[Time 2000 ms]
        H --> I[Define i_counter to i_counter + 1]
        I --> J[else if i_counter == 1]
        J --> K[Move Motor at Port1 Clockwise Speed: Medium]
        K --> L[Time 2000 ms]
        L --> M[Define i_counter to i_counter + 1]
        M --> N[else if i_counter == 2]
        N --> O[Move Motor at Port1 Clockwise Speed: High]
        O --> P[Time 2000 ms]
        P --> Q[Define i_counter to i_counter + 1]
        Q --> R[else]
        R --> S[Move Motor at Port1 Stop Speed: High]
        S --> T[Time 2000 ms]
        T --> U[Define i_counter to 0]
        U --> C
    end
```

The code is a Scratch-style script for a motor control program. It starts with a 'My Program' block. The first two blocks are 'Define i_counter to 0' and 'Define i_TouchSensorVal to 0'. These are followed by a 'Repeat while true' loop. Inside the loop, the first block is 'Define i_TouchSensorVal to Read Touch Sensor at Port1'. This is followed by an 'if' block with the condition 'i_TouchSensorVal > 500'. Inside this 'if' block, there is another 'if' block with the condition 'i_counter == 0'. This inner 'if' block has three 'do' blocks: 'Move Motor at Port1 Clockwise Speed: Slow', 'Time 2000 ms', and 'Define i_counter to i_counter + 1'. This is followed by an 'else if' block with the condition 'i_counter == 1', which has two 'do' blocks: 'Move Motor at Port1 Clockwise Speed: Medium' and 'Time 2000 ms', followed by 'Define i_counter to i_counter + 1'. This is followed by another 'else if' block with the condition 'i_counter == 2', which has two 'do' blocks: 'Move Motor at Port1 Clockwise Speed: High' and 'Time 2000 ms', followed by 'Define i_counter to i_counter + 1'. Finally, there is an 'else' block with two 'do' blocks: 'Move Motor at Port1 Stop Speed: High' and 'Time 2000 ms', followed by 'Define i_counter to 0'. The script ends with the 'Repeat while true' loop block.

Lets Play!

Setup

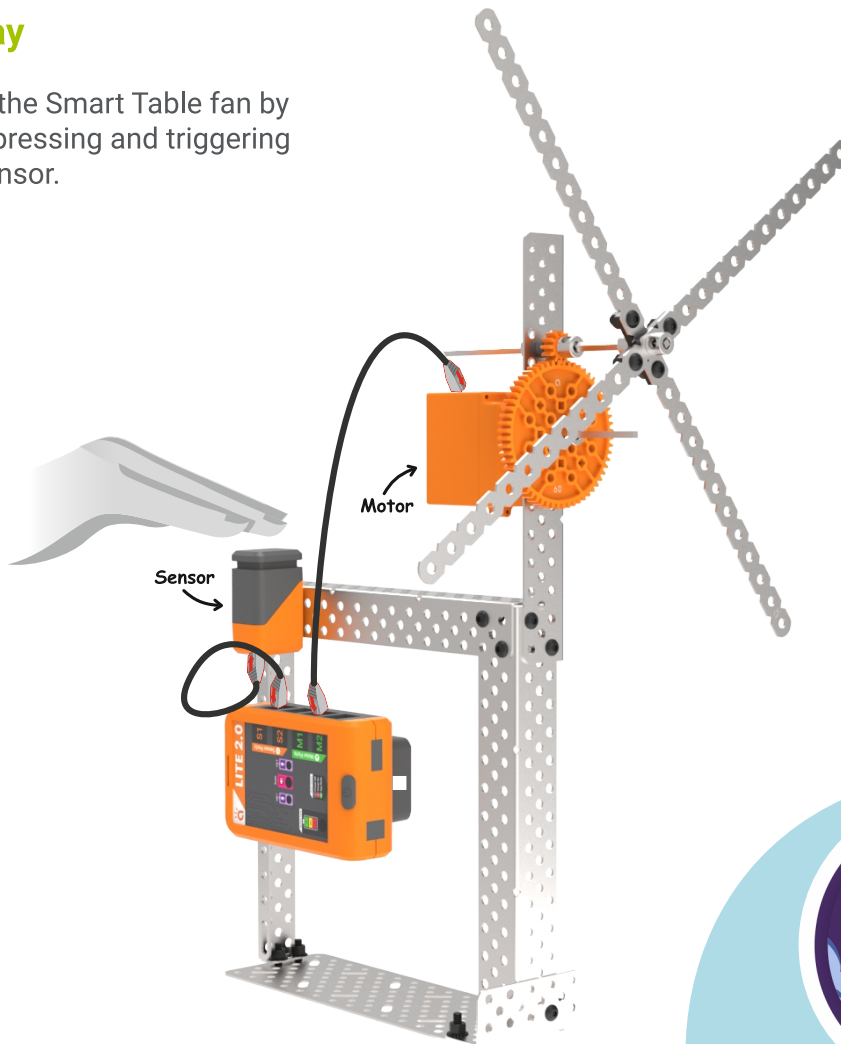
- Connect the High Speed Motor to M1, using the connecting cable.
- Connect the Touch Sensor to S1, using the connecting cable.
- Turn ON the Robotics LITE 2.0 Brain



- Make your Code on Avishkaar Maker Studio (AMS).
- Burn the Code to the LITE 2.0 Brain using AMS Burn Tool (ABT)
- For instructions on AMS and ABT download, installation and usage, refer to Pg. no. 29.

How to Play

Interact with the Smart Table fan by sequentially pressing and triggering the Touch Sensor.



Explore on your own

There are a lot of possibilities to make gesture controlled robots. Can you try and make a gesture controlled fan using an IR sensor? How about a touch controlled door lock? Or a Touch control Light ON/OFF ?



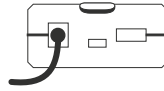
Congratulations !

Give yourself the 'Fifth Project Badge' sticker on your Achievement Sheet on Pg. no. 6

Troubleshooting



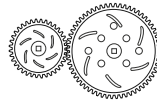
Check if you have connected the ports as mentioned in the chapter.



Check whether the wire is connected properly or not.



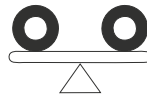
Check if the battery is connected properly to the brain or not.



Check if gears are meshed properly or not.



Check if the axle shaft is properly connected.



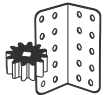
Check your structure is stable or not.



Check if the sensor is working properly or not by using LCD Display.



Check if your sensor is connected at proper height or not.



Check if any of the gear is not stuck with any plate.

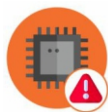
Facing an issue?



Software Issues



Usability Issues

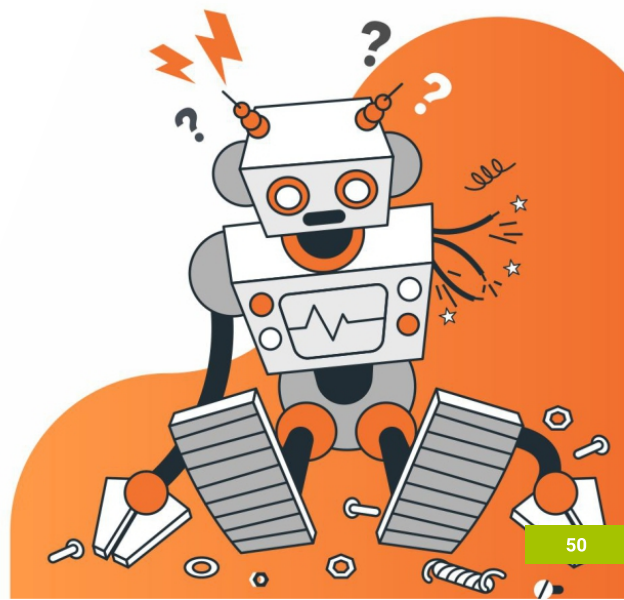


Hardware Issues

Contact support by scanning the QR Code.



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